BURNING OUT DURING THE RITE OF PASSAGE: FACTORS THAT INFLUENCE BURNOUT AND SOLUTIONS FROM RESIDENT PHYSICIANS

by

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Abstract

A high prevalence of burnout has been recorded among resident physicians. This is especially true among front line care providers such as Internal Medicine (IM) residents and Emergency Medicine (EM) residents. However, very few studies have explored the factors that influence burnout and the solutions needed to reduce burnout among these populations. Hence, this dissertation explored factors that influence burnout among resident physicians. Additionally, it helped to identify appropriate interventions to pursue based on the inputs from the residents themselves. The specific aims of this dissertation were: 1) to identify factors, good and bad, that influence burnout among resident physicians; 2) to generate clusters of factors by combining similar factors; 3) to identify the most important and changeable factor(s) and clusters that influence burnout among these resident physicians; and 4) to identify the similarities and differences in results between two different residency programs.

An integrated mixed-method called Concept Mapping was used for this dissertation. There were three phases in this study. Phase 1 involved residents generating factors they believe influence burnout. Phase 2 involved residents sorting these factors into groups based on perceived similarities, and rating each factor on its importance to burnout and its changeability. Phase 3 involved

interpretations of the results generated from phase 1 and phase 2. A total of 52 IM and EM residents from the Johns Hopkins Hospital participated in at least one of these phases. Using multidimensional scaling and hierarchical cluster analysis provided by the Concept Systems online website, cluster maps were created and summary statistics on the most important and most changeable clusters and factors were produced.

The IM and EM residents generated 71 factors that they thought influenced burnout, and they were grouped into five different clusters: 1) patient factors, 2) work environment, 3) profession satisfaction, 4) quality of work life, and 5) coping strategies. Four factors that were rated as most important and most changeable were also identified: 1) working long stretches of a day without a day off, 2) mentorship, 3) relationship with supervising residents, and 4) opportunity to voice concerns. Residents suggested "work environment" cluster as the most changeable cluster based on their experience rotating in multiple settings. They also viewed the "patient factor" as moderately important in influencing burnout but considered this cluster as the least changeable. There were no striking differences between IM and EM residents in the clusters that influenced burnout or in their priorities for intervention.

There are several limitations in this study: 1) it did not reach saturation so some of the factors that influence burnout among resident physicians might be missing, 2) it was conducted among IM and EM residents at the Johns Hopkins Hospital whose experiences with the residency program might not be shared universally by all residents. However, even within these limitations, there are several contributions of this dissertation: 1) it helps to identify and expand the factors that influence burnout among residents, 2) it generates clusters that aggregate these factors, 3) it discovers that IM and EM residents generate qualitatively similar factors for burnout and rated quantitatively similar factors for the purpose of interventions, and 4) it also helps to recognize factors that were rated by residents as the most important and changeable.

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“All of my happiness was lost on that day”-

Dedicated to my beloved mother who has always reminded me that I am the only son in the family.

Dedicated to my beloved nieces and nephews – Nadra Najiha, Armaan Aariz, Noor Zafirah, Abdul Rahman and Rehan Nauman whom I love immensely and dearly.

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This doctoral dissertation is a product of a childhood dream. It is a fulfillment of certain naiveté. The journey to earn this doctoral degree is extremely long and arduous. I have to leave my own mother, father, sisters, nieces, nephews, families, friends and my own homeland to pursue this degree. Born and brought up in the blessed land of Malaysia, it is quite miraculous to think about the miles I have taken to produce this dissertation in a language quite foreign to me.

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would recall the day her grandmother died so vividly as if it had happened yesterday. “All of my happiness was lost on that day” was how she would recall that fateful day. It was one of the hardest sentences I have ever heard in my life. Like all naïve child – I wanted to restore my mother’s lost happiness. Education was the only stable and promising route I knew; so, from very early on I was mapping my journey to Oxford. I didn’t end up at Oxford but instead in a better institution call “The Johns Hopkins University” (laughing). So, my long journey to pursue this degree started because of her. It is about restoring my mother’s lost happiness.

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Humans have long been perplexed by the array of diseases and illnesses that we experience. From the Western civilization to the Muslim civilization (Gutas et al., 2012), from the ancient Greek (Edelstein et al. al., 1967; Jouanna et al., 2012; Longrigg et al., 2013) to the modern day America (Duffy, 1976; Ludmerer, 1999), humans have long tried to eliminate diseases and restore our health. We have danced to propitiate the angry gods and goddesses to restore our health (Duffy, 1976). We have searched our nature in order to find the elixir (Duffy, 1976; Whorton et al., 2002). We have expelled diseased humans from our tribal structure (we still do this today as we regulate the kinds of healthy "aliens" allowed to transcend our borders) (Oldstone et al., 1998). Later, as we advanced, we studied our cells and organs and resorted to pills, liquids, and surgeries to bring our health back (Ludmerer, 1999; Whorton et al., 2002). And, we created the field of public health (Rosen, 1958; Fee, 1987).

We also began to understand the reasons for why diseases emerged in the first place (Rosen, 1958; Oldstone et al., 1998). We humans are an inquisitive bunch. But not all of us have the same level of curiosity and skills. So, we needed

specialized men who could restore our health. From the philosophers and healers of ancient Greece (Edelstein et al., 1967; Jouanna et al., 2012; Longrigg et al., 2013) to the shamans of the Native Americans (Duffy, 1976) to the current medical doctors in modern day America (Duffy, 1976; Ludmerer, 1999), we realized the importance of specialized individuals who possess sufficient knowledge to restore our health. There are, of course, no precise and perfect ways to create these specialized individuals. *We resort to our culture to produce them*. *We created rites of passage to create them.* Think about this irony - Hippocrates, the founding father of medicine, an ancient Greek man (Edelstein et al., 1967), might not even qualify to carry the title medical doctor or practice medicine in modern day America because he experienced none of the culturally-constructed rites of passage we have in place today.

We have come a long way from the time when barbers were trained on the second floor of a pharmacy to be doctors as we once did in America (Duffy, 1976). Now, we have large publicly and privately funded institutions just to train these specialized men (and later women (Ehrenreich & English, 1973; Melosh, 1985)). We also sought help from the nurses (Ehrenreich & English, 1973; Melosh, 1985). We evolved from a field for charity to a field housed in bricks and mortars, and

some of these hospitals are traded in New York Stock Exchange (Risse, 1999). We created exams in order to selectively choose men and women from our society and from all over the world before allowing them to learn medicine and practice medicine (Desbiens & Vidaillet, 2010; Wainer, 2014). And, we created the residency program to further train our newly minted medical graduates.

One could argue that this residency program has created extremely well-trained and knowledgeable medical doctors serving in the most expensive and advanced healthcare system. However, various studies have also pointed out that a large number of resident physicians would not recommend their job to others or would not choose medicine if given a second chance (Cohen & Patten, 2005; Landrigan et al., 2008). For example, Landrigan et al. (2008) found that 74% of resident physicians in their study would not recommend their job to others. Furthermore, Shanafelt et al. (2002) also found that almost 76% of resident physicians reported burnout. Collier et al. (2002) in their nationwide survey conducted in all 415 medical residency programs in the US found that 35% of resident physicians reported depressive symptoms and 23% said they had become less humanistic toward their patients after starting the residency program. Additionally, a national-level study of residents and fellows combined found that 50.8% screened

positive for depression (Dyrbye et al., 2014). A meta-analysis of 54 studies with 17 560 residents from 1963 to 2015 found that 29% of the residents experienced depression or depressive symptoms (Mata et al., 2015). In another study of residents from six university hospital settings in the US, 3.9% of the 565 residents were found to have suicidal ideation (Goebert et al., 2009). Makary et al. (2007) in their study of surgical residents from 17 hospitals found that 83% (582 out of 699) reported having experienced needle stick injuries. Finally, in another study of 4128 residents, one-half of 2nd to 5th year residents reported that they could not afford to buy textbooks for their residency training, and other financial and emotional distress was also widely reported (Collier et al., 2002). All of these data point to the fact that residency is a very tough period for many resident physicians. Doctors are individuals trained to provide healthcare to the population, so it is quite ironic that the profession itself is an immense cause of stress, burnout, depression and injury to many of them (Levey et al., 2001).

The purpose of residency programs is to train the newly graduated medical students to become doctors, and it is typically three to five years. This is a compulsory period when newly minted medical graduates try to learn as many skills and as much knowledge related to the practice of medicine as they can.

Anthropologists refer to this phase as the second stage of the rite of passage in becoming a doctor as liminality (Turner, 1973). The first stage of this rite of passage is the medical school and the final stage is becoming physicians. During this second stage, the newly graduated medical students encounter certain laws, customs, rules and behaviors that help to form the doctor identity (Turner, 1973).

If a rite of passage inflicts great amounts of pain even as it offers us many great values – should we not try to change it? If a rite of passage produces harms in the forms of suicide and suicidal ideations as noted above – should we still insist that it needs to be practiced as it is?

1.2 The Residency Program and the Making of Medical Doctors in the U.S. Today

The proverbial image of medical doctors wearing white coats and carrying stethoscopes around their necks is many hundreds of years in the making. The Johns Hopkins University is the first institution to introduce four years of medical school post-baccalaureate in the United States in 1893 (Ludmerer, 1999). Prior to that, Americans had travelled to Europe to acquire medical degrees (Ludmerer, 1999). One could argue that the American medical schools found their genesis from European medical schools. However, at the beginning of the 20th century,

American medical schools were deemed to provide inferior education to their students (Ludmerer, 1999). It took Abraham Flexner and his "Flexnerian revolution" in the 1920s to better structure the medical education in America (Ludmerer, 1999). Stringent entry requirements were introduced, and four years of training were demanded from all medical schools (Ludmerer, 1999). It was due to this Flexnerian revolution that American medical graduates slowly outperformed European medical graduates (Ludmerer, 1999).

Today, after graduating from medical schools -- whether inside or outside the United States -- the new doctors must sit for the United States Medical Licensing Examination (USMLE) before they can apply to residency programs, which are required to become a practicing physician. USMLE consists of three parts or also known as steps: Step 1, Step 2 CK and Step 3. USMLE Step 1 has always been considered as the most important exam to gain a residency place in US hospitals. It tests general scientific knowledge of the doctors (USMLE, 2015). This exam can only be taken once if passed. This exam is extremely crucial in deciding the doctors' residency program placement. The scores are reported on the scale of 1 to 300. The median score of USMLE Step 1 first time test takers graduating from the US and Canadian medical schools is about 230 from 2012 to 2014 (USMLE,

2015). USMLE Step 2 CK is also known as the clinical test. This examination tests the medical doctor's clinical knowledge. Finally, USMLE Step 3 examination tests the application of biomedical and clinical knowledge. After passing these three exams, medical graduates register themselves in the National Resident Matching Program (NRMP) or also known colloquially as "The Match." Medical graduates apply to their residency program through this website by submitting their applications (Ziegelstein, 2007). Once the applications have been submitted, it is up to the residency programs to decide on the candidates they would like to interview. Once called to the interview, the medical graduates will spend a great deal of money travelling to the respective institutions. Finally, once the interview process has ended each medical graduate ranks his or her preferred residency program. Each residency program too ranks their preferred candidates. If both rankings match, the medical graduates will be informed of the match on a special day called "match day". This match day has its own unique tradition where medical graduates will open the envelope of their future residency program together with fellow friends and family members.

1.3 The Focus of this Dissertation

Medicine is a dynamic and evolving field. Scientific inputs from our universities, policies created by lawmakers and products from our pharmaceutical industries have continued to shape its trajectory. So, I was curious, why the training of our specialized men and women has changed very little since we imported the residency program from Germany in late 1880s (Bliss, 1999). Sure, the hours of residency have shrunk from 24 hours, 7 days a week in the 1880's to 80 hours per week today. We now pay salaries to our medical doctors, and we have publicly funded healthcare systems. And yet, a high prevalence of burnout among resident physicians is commonly reported (Shanafelt et al., 2002; Takayesu et al., 2014).

Burnout in the context of resident physicians could be defined as "increased feeling of emotional exhaustion", "the development of negative, cynical attitudes and feelings about [patients]" and the "tendency to evaluate oneself negatively" (Maslach & Jackson, 1981 p.99). Given the high prevalence of burnout among resident physicians – shouldn't we explore the factors that contribute to the burnout and identify the appropriate interventions to reduce burnout? After all, empirical evidence has shown various associations between burnout among resident physicians and outcomes, such as self-report of medical errors (Prins et

al., 2009; Chen et al., 2013; De Oliveira et al., 2013), inadequate patient care (Shanafelt et al., 2002), suicidal thoughts (Van Der Heijden et al., 2008), career dissatisfaction (Becker et al., 2006) and near misses in motor vehicle crashes (West et al., 2012). These studies have shown that burnout has long-term consequences, not just on the individual resident physicians, but also on patient safety.

It was for these reasons that I chose to study burnout among resident physicians. The setting for this dissertation is the Johns Hopkins Hospital. It was here at the Johns Hopkins Hospital that the residency program was first initiated in the United States in order to train medical graduates (Bliss, 1999; Johns Hopkins Medicine, 2014). It is therefore extremely befitting, to re-visit this rite of passage at this very pioneering institution. To be precise, this dissertation explores positive and negative factors that influence burnout among resident physicians and identifies solutions that residents themselves think worthy of concentrating on in order to reduce or eliminate burnout.

Resident physicians from two specialties at the Johns Hopkins Hospital were recruited to participate in this study: 1) emergency medicine (EM) and 2) internal

medicine (IM). These two different programs were chosen because they are front line care providers who have frequent interactions with patients and other front line care providers (Shanafelt et al., 2012; Enoch et al., 2013), and they have recorded a high prevalence of burnout in previous studies (Goldberg et al., 1996; Shanafelt et al., 2002; Arora et al., 2013; Takayesu et al., 2014). However, there are also some differences between these two programs, including the types of treatment they provide and types of patients they care for (Asplin, 1997; Kazzi & Schofer, 2003).

1.4 The specific aims for this dissertation

There were four specific aims for this dissertation:

1) To identify factors, good and bad, that influence burnout among resident physicians.

This aim helped to better understand all the factors that influence burnout among residents. Both positive and negative factors were gathered in order to have a comprehensive picture of how factors influence burnout.

2) To generate clusters of factors by combining similar factors into clusters

This was done because many factors do share similarities and differences with each other.

3) To identify the most important and changeable factors and clusters that contribute to burnout among these resident physicians.

This aim was important in helping to identify factors that might help to create future interventions from the resident physicians' perspectives. Changeable factors are factors the resident physicians think could be changed whereas important factors are factors they think as important in influencing burnout. This question is a form of needs assessment for future intervention studies.

4) To identify the similarities and differences in results between two different residency programs.

By conducting the study in internal medicine program and emergency medicine program, the study will be able to compare the factors for burnout and the solutions from these two programs.

Chapter 2: Literature Review

In this chapter, studies related to how sociologists and anthropologists viewed the residency program are first discussed. Next, the operationalization of the concept of burnout and its theoretical foundation are reviewed followed by factors for burnout among residents and the interventions used to reduce burnout among residents.

2.1 Residency programs in America as a Rite of Passage

Sociologists and anthropologists have conducted many studies of the residency programs in the US because of interest in understanding this rite of passage. There are two main themes that emerged from these sociological and anthropological studies: 1) residency is a period of socialization where medical graduates are transformed into physicians through the process of acquiring the appropriate medicals skills and by performing their assigned duties (Merton et al., 1957; Arluke, 1980; Mizrahi, 1985; Yedidia et al., 1995; Bosk, 2003; Hamstra et al., 2008; Veazey Brooks & Bosk, 2012; Szymczak & Bosk, 2012), and 2) residency is also a period in which the identity of new physicians is constructed through rituals such as the morning report where resident physicians deliver case reports of patients to the attendees and other resident physicians (Hamstra et al., 2008;

Holden et al., 2012; Veazey Brooks & Bosk, 2012). Resident physicians themselves tend to agree with these themes (Shem, 1978; Szymczak & Bosk, 2012). Disruption to this rite of passage is highly debated. For example, a change in this rite of passage through, for example, the duty hour regulations which limit the number of hours resident physicians could work, is viewed by other physicians as affecting the socialization process of the resident physicians (Veazey Brooks & Bosk, 2012) even when the change is introduced with noble intentions.

Moreover, sociology and anthropology studies tend to paint residency as a very stressful and rough period. Mizrahi (1985, p. 216), for example, noted that residency is tantamount to "a baptism by fire". Mizrahi (1985, p. 216) also observed that residency for many resident physicians is "a period of first employment" where "a confrontation across class lines" takes place between residents and patients, especially among patients who are poor or homeless. She also argued that resident physicians worked "long hours for a modest salary" and felt "degraded" (Mizrahi, 1985 p. 216). Despite the "promise of future rewards in the forms of wealth, status and autonomy", this "degradation breeds resentment" (Mizrahi, 1985, p. 216). She also added that residents are also supervised by medical faculties who are "more experienced" but less

"overworked" than themselves throughout their residency (Mizrahi, 1985, p. 231). Finally, resident physicians are viewed as living through a period in which they are acquiring knowledge and skills and are under surveillance (Shem, 1978; Szymczak & Bosk, 2012).

It is crucial to note that no sociological or anthropological studies have looked at the relationships between the construct burnout with socialization and identity formation. This dissertation will not address this construct directly. Instead, these sociological and anthropological studies helped to inform scholarly understanding of the "lived experience" of some of these resident physicians, which might help to inform both the factors for burnout and solutions needed to reduce burnout. For example, factors and solutions to burnout, which might be unique to residency, might include relationships between the resident physicians and the hierarchical nature of the residency program.

2.2 What is Burnout?

Freudenberger (1974), who was trained as a psychiatrist, was noted by Muheim (2013 p.41) as the first individual to introduce the construct "burnout" as a "psychological–psychiatric term". Freudenberger (1974) observed his own

burnout syndrome while working in the free clinic movement. He borrowed the dictionary's definition for "burnout" that means, "to fail, wear out, or become exhausted by making excessive demands on energy, strength, or resources" before linking the definition to his own burnout syndrome (Freudenberger, 1974 p. 159). He also discussed multiple physical and behavioral manifestations of burnout and methods to reduce them, including reducing workload and limiting work hours to nine hours (Freudenberger, 1974).

The construct "burnout" was also introduced separately by Christina Maslach and Susan Jackson, two psychologists from the University of California at Berkeley (Maslach & Jackson, 1981). They defined "burnout" as "a syndrome of emotional exhaustion and cynicism that occurs frequently among individuals who do 'people-work' of some kind" (Maslach & Jackson, 1981 p. 99). This construct could be traced back to the "popular usage from a 1961 novel called 'A burn-out case'" which told a story of an architect who quit his job and moved to an African jungle (Maslach et al., 2001 p. 398). Hence, its everyday presence and usage among the people made Maslach et al. (2001 p. 398) call this construct the "language of the people". Maslach et al., (2001 p. 400) also argued that burnout was first introduced as an "individual's relational transaction in the workplace"

2.3 Operationalizing the construct of burnout

Maslach and Jackson operationalized the construct "burnout" by using the Maslach Burnout Inventory (MBI). According to them (Maslach & Jackson, 1981 p. 99), burnout is composed of three aspects:

1) "increased feelings of emotional exhaustion";
2) "the development of negative, cynical attitudes and feelings about one's clients [e.g., patients]"; and
3) "the tendency to evaluate oneself negatively."

They divided their Maslach Burnout Inventory (MBI) into three subscales/domains/dimensions: 1) emotional exhaustion (9 items), 2) personal accomplishment (8 items), and 3) depersonalization (5 items). The subscales and items were created both based on their previous exploratory work through interviews and questionnaires and factor analysis (Maslach & Jackson, 1981; Maslach et al., 2001). Each item was rated by using both frequency and intensity ratings by asking the question of how often and how strong at the same time (Maslach & Jackson, 1981). The Cronbach's alpha for each of these three subscales ranged from 0.74 to 0.89 for both intensity and frequency in a sample of 605 individuals from various service industries such as physicians, policemen,

teachers, and nurses (Maslach & Jackson, 1981). Lee & Ashforth (1990) conducted a series of confirmatory factor analyses using MBI among managers and supervisors from a larger public welfare agency and confirmed the three-factor models. They also found that the domain emotional exhaustion and depersonalization are highly correlated (Lee & Ashforth, 1990).

It is important to add that burnout is sometimes treated as a multidimensional construct and other times as a unidimensional construct (Brenninkmeijer & VanYperen 2003). Hence, some studies reported burnout based on the three subscales whereas others aggregated these subscales into one larger burnout construct. The argument for using burnout as a unidimensional construct is that burnout is a multifaceted syndrome and all these facets must be taken into account when measuring burnout whereas argument for using it as a multidimensional construct is that it is dominated by the emotional exhaustion dimension (Brenninkmeijer & VanYperen 2003). Finally, there is no biomarker to identify or categorize burnout individuals: in a systematic review of 31 studies using 38 biomarkers, Danhof-Pont et al. (2011) found no biomarker capable of measuring burnout.

For this study, the MBI was chosen as the foundation to define the construct burnout because MBI has been widely used to measure burnout among resident physicians. Furthermore, as noted previously, MBI was the initial survey that laid the foundation for this construct and it has continued to influence research related to burnout. However, for the purpose of this dissertation, no data of burnout among resident physicians will be collected using the MBI and hence its purpose is to merely to guide the definition of burnout.

One of the biggest debates in the burnout scholarship is whether burnout is truly different from other constructs such as stress and depression. As noted by Maslach et al. (2001, p.403), "some of the early discussion about burnout focused on issues of discriminant validity—that is, was burnout truly a distinctly different phenomenon from other established constructs," including stress and depression. Empirical evidence as to whether these three constructs are similar, different, overlapping or antecedents to each other have, so far, produced mixed results. On one side is the study conducted by Bakker et al. (2000) that found burnout and depression as two different constructs through confirmatory factor analysis. They also found that lack of feeling reciprocity at work among the workers was predictive of both burnout and depression while lack of feeling reciprocity in

private-life was predictive of depression but not burnout (Bakker et al. 2000). This, they argued, showed that burnout was not affected by lack of reciprocity outside of the occupational domain (Bakker et al., 2000). Apart from that, Iacovides et al. (1999) found no empirical relationships between burnout (measured using MBI) and depression (measured using the Ng Self-Rating Depression Scale) among nurses despite the two constructs sharing what they later termed as "similar 'qualitative' characteristics" (Iacovides et al., 2003, p. 218).

On another side, the relationships between burnout measured using MBI and depression measured by Beck Depression Inventory conducted by Hakanen & Schaufeli (2012) with 71% of all dentists in Finland for three years found that burnout predicted depressive symptoms but not the other way around (Hakanen & Schaufeli, 2012). Govardhan et al. (2012) also found similar results that resident physicians with high emotional exhaustion were more likely to report depression. About 80% of residents who were found to be depressed also scored highly in emotional exhaustion and depersonalization domains of burnout (Waldman et al., 2009). Apart from this study, various studies have also shown correlation and association between burnout and stress (McManus et al., 2002; Braithwaite,

2008; Lee et al., 2008; Xie et al., 2011; Passalacqua & Segrin, 2012; Swami et al., 2013).

2.4 The theoretical underpinning of burnout

Maslach et al. (2001) postulated the manifestation of burnout through the Job-Person Fit Theory. This theory is based on the integration of both individual and environmental factors. This theory tries to relate the individuals with six job environment domains: 1) workload, 2) control, 3) reward, 4) community, 5) fairness and 6) values. When there is a mismatch between the person with some or all of these six domains, burnout will manifest (Maslach et al., 2001).

Hence, this theory uses the fit between the person and the job environment to explain burnout. When there is a mismatch between the job and the person with either one or all the domains mentioned – burnout might manifest in the individuals. For example, some individuals might not have the capacity to handle the workload given to them and hence might experience burnout. Likewise, an individual who feels that he or she has no control over his or her job might be prone to experience burnout. This theory places the individuals within the context

of their workplace by taking into account their ability to fit with the demands of the work and the workplace.

Finally, in the book, “Burnout for Experts”, Aydemir & Icelli (2013) listed various risk factors associated with burnout. They defined risk factors as “internal or external causes that increase an individual’s chance of developing a disease” (Aydemir & Icelli, 2013 p. 119), and divided risk factors into two main factors: 1) environmental risk factors and 2) individual risk factors. Many of the factors listed by Aydemir & Icelli (2013) are not related directly to burnout. For example, shift work is cited with the assumption that it distracts social life (Aydemir & Icelli, 2013). They also divided risk factors for burnout based on external or internal causes as shown in Table 1.

Table 1. Risk factors for burnout identified by Aydemir & Icelli (2013)

Environmental Factors	Individual Factors
• Work overload • Lack of control • Insufficient Reward • Breakdown of the community • Absence of fairness • Conflicting Values • Job Insecurity • Human-computer interaction • Involvement with people	• Personality Traits • Neuroticism • Extraversion • Agreeableness • Openness • Conscientiousness • Negative Affectivity • Hardiness • Locus of Control

• Daylight • Shift work • Ambient noise • Overcrowding	• Alexithymia • Type A Behavior • Type D Behavior/Personality • Perfectionism • Dispositional Optimism • Proactive Personality • Personality Disorders • Various demographic features such as gender, age, marital status, education • Neurobiological features

2.5 The prevalence of burnout among residents and associated risk factors

The prevalence of burnout among resident physicians has been examined by various studies and the risk factors for burnout were typically identified in the same studies by using the bivariate analysis of various factors such as workload, gender, student loan debt, and marriage status. Thomas (2004) in his literature review, for example, divided the risk factors for burnout into three categories: 1) work environment, 2) demographics, and 3) personal characteristics. I will be combining the prevalence and risk factors data from each paper instead of separating prevalence and risk factors into two different sections because by relating prevalence to the risk factors, a better context of the risk factors could be identified and understood. This section gathers all studies based on their

categories. Hence, I have created four categories in this section: 1) internal medicine, 2) emergency medicine, 3) all others residency programs in the US and 4) residency programs from outside of the US.

Burnout is not just an outcome of being many years in the residency. Ripp et al. (2010) found that about 34% of the 145 incoming Internal Medicine residents at the Mount Sinai School of Medicine who completed a survey during their orientation reported burnout. Ripp et al. (2010) found that certain individual characteristics such as lacking confidence in their knowledge and skills, being anxious and disorganized was associated with an increase in the prevalence of burnout. However, demographic characteristics such as 1) gender, 2) marital status, 3) time off between school and residency, 4) foreign medical school graduates or US medical school graduates were found not to be associated with burnout (Ripp et al., 2010 p. 174).

2.5.1 Internal Medicine

Shanafelt et al. (2002) in their study of an internal medicine residency program in a university hospital in Seattle, Washington found that 87 out of the 115 resident physicians or 76% reported burnout. Those who were identified to meet the

burnout criteria also tend to report depression and take more than a one-year gap between undergraduate and medical school (Shanafelt et al., 2002 p. 362). Job satisfaction, on the other hand, was inversely related to burnout and finally, Shanafelt et al. (2002) found that there was no difference between alcohol use or substance abuse among residents with burnout and residents who do not have burnout.

Campbell et al. (2010) studied burnout among internal medicine residents at the University of Colorado Denver Health Science Center. About 86 out of 179 residents completed the survey throughout their residency program (the survey data was collected once at the end of each residency year). 78% of them reported burnout at least once during their three years in the residency program. The burnout prevalence during internship and the second year were both 67% while the prevalence of burnout among third year residents decreased to 57%. Campbell et al. (2010) also noted that the number of on-calls and hours worked reported by interns were the highest followed by the second year residents and finally the third year residents. However, they did not perform any statistical tests to relate burnout with aforementioned factors. Campbell et al. (2010) found that 49% of the residents were experiencing burnout throughout the three years of

residency while only 22% did not report burnout during their residency program. They also found that male were 3.31 times more likely to be identified as experiencing burnout compared to females and those reporting depression during the internships were 4.4 times more likely to have burnout throughout the whole residency program.

2.5.2 Emergency Medicine

Takayesu et al. (2014) conducted a study on burnout among resident physicians in eight different emergency medicine programs located throughout the US. 218 of the 289 eligible resident physicians (75% response rate) completed the MBI survey. Out of these 218 resident physicians, 142 residents or 65% of them were classified as facing burnout. Takayesu et al. (2014) also found no correlation between individuals with burnout and age, years in residency and sex. However, there was a significant correlation between the relationship status and burnout with married resident physicians reporting higher prevalence of burnout compared to singles.

2.5.3 Other residency programs in the US

Fahrenkopf et al. (2008) in their study among three pediatric residency programs located in two different states: California, Massachusetts and Washington, DC found that 92 out of 123 residents or 74% reported burnout. In their study, they found no association between various demographics factors such as 1) age, 2) sex, 3) year of residency, 4) ethnicity, 5) marital status, 6) sleep hours and 7) work hours with burnout (Fahrenkopf et al., 2008).

Pantaleoni et al. (2014) conducted a longitudinal study by following pediatric residents for two years in an academic hospital affiliated with the Stanford University School of Medicine. Burnout data using the MBI were taken at six time points: 1) the start of residency, 2) mid-intern year, 3), end-intern year, 4) mid-junior year, 5) end-junior year and 6) mid-senior year (Pantaleoni et al. 2014 p. 168). They argued that in order to maintain the confidentiality of the survey, they never assigned a unique code to each study participant and hence the same individuals were not followed throughout time. Based on the data collected during the start of residency, only 6% of the incoming resident physicians could be categorized as having high emotional exhaustion while 13% reported high depersonalization. This changed drastically during the mid-intern period with 44%

now fit into the category of individuals with high emotional exhaustion while 48% reported high depersonalization. However, the data on personal accomplishment didn't change between both periods. While the prevalence of burnout tends to be higher throughout the timeline compared to during the start of residency, only the increment between the start of residency and mid-intern period was found to be statistically significant. Pantaleoni et al. (2014) didn't collect any demographic data beyond their years of residency and hence didn't report any risk factors.

Among 136 obstetrics and gynecology residents from 14 programs in Texas, only 24 or 17.6% fit into the burnout category when all the domains were combined (Garza et al., 2004). However, when the burnout domains were studied separately - 38.2% reported high emotional exhaustion, 47.1% reported high depersonalization, and 19.1% reported reduced personal accomplishments (Garza et al., 2004). The study also found that female resident physicians were more likely to report burnout (Garza et al., 2004). Furthermore, they also found that interns were less likely to report burnout than upper level residents (Garza et al., 2004).

This low burnout percentage among obstetrics and gynecology was contradicted in a study conducted in a university hospital in Michigan where almost 76% obstetrics and gynecology residents reported burnout (Martini et al., 2004). These obstetrics and gynecology residents recorded the highest percentage of burnout compared to seven other specialties, with family practice residents reporting the lowest percentage of burnout (27%) (Martini et al., 2004). Overall, in Martini et al.'s (2004) study, which surveyed 110 resident physicians from eight different specialties at Wayne State University's School of Medicine, 49% reported burnout. They also found that residents in the first year were more likely to report burnout (77.3%) compared to residents in the second year or higher (41.8%). After controlling for program and work hours (>80 hours), they still found that residents in the first year more likely to report burnout. Furthermore, those who said that they were dissatisfied with clinical faculty were more likely to report burnout than those who were satisfied. Finally, resident physicians who reported that they were married or faced no family stress were less likely to report burnout (Martini et al., 2004).

Afzal et al. (2010) conducted a study among resident physicians attending seven training programs at Texas Tech. This hospital is located in a city where the

dominant population is Hispanic and who speak Spanish as the primary language. A total of 134 out of 166 residents completed their survey. However, only 115 were included in the statistical analysis as the rest contained “missing values for some of the variables” (Afzal et al., 2010 p. 609). The obstetrics and gynecology residents were 13.55 times more likely to report high emotional exhaustion compared to the reference group (i.e., Family practice). Psychiatry residents were 6.5 times more likely to report high emotional exhaustion while internal medicine residents were 0.22 times more likely to report emotional exhaustion compared to Family practice. The rest of the specialties were not statistically significant. No demographic factors (i.e., race, place of being raised, marital status, primary language, age and sex) were found to the statistically significant in their contribution to high emotional exhaustion. For the high depersonalization category, only obstetrics and gynecology residents and internal medicine residents reported significantly high depersonalization. Again, no demographic factors were associated with this category. Only internal medicine residents recorded significant low personal accomplishment compared to the reference group (Afzal et al., 2010).

Another study conducted by Gopal et al. (2005) studied burnout prevalence before and after the 80 working-hours restriction was made for resident physicians. Gopal et al. (2005) measured burnout in May 2003 (a month before the 80 working-hours restriction was made) and a year later among internal medicine resident physicians at the University of Colorado Health Sciences. The prevalence of burnout decreased from 61% (74 out of 121 resident physicians) in May 2003 to 55% (58 out of 106 resident physicians) in May 2004. This change was not statistically significant. The only component that was identified to be statistically significant was the decrease of the prevalence of resident physicians with high emotional exhaustion. While the number of work hours per week reported by the resident physicians decreased between these two time points, the number of hours slept during call didn't change significantly (Gopal et al., 2005).

Willard-Grace et al. (2014) studied the relationship between team culture and structure and emotional exhaustion among 231 clinicians and 280 staff. About 37% of these 231 clinicians were resident physicians. Factors positively associated with increased emotional exhaustion include: 1) number of half days worked, 2) being a resident and 3) making a transition to electronic health records.

Salles et al. (2014) studied the relationship between a personality trait called "grit" and burnout among resident physicians. Grit is considered as "measure of perseverance" (Salles et al., 2014 p. 252). They hypothesized that resident physicians with high scores in grit will record low rates of burnout. They found that resident physicians with high score in grit tend to report low rates of burnout. Hence, personality trait could also contribute to burnout.

2.5.4 Residency programs outside of the United States

A study conducted in Lebanon among residents from various units found that almost 80% of residents reported high burnout in at least one of three domains in the Maslach Burnout Inventory (MBI) (Ashkar et al., 2010). A study conducted in Switzerland, on the other hand, found only 3.7% of residents reporting high burnout while another 35.1% reported a moderate level of burnout (the researchers divided burnout into three levels: high, moderate and low) (Businger et al., 2010). However, this study also included both surgeon residents and surgeons (Businger et al., 2010). They also found that high workload as a strong prediction to this high burnout (Businger et al., 2010).

Meanwhile, a study conducted in Netherland found that almost 20.6% of residents reported burnout (Van Der Heijden et al., 2008). This study was conducted with the intention to examine the relationships between burnout with suicidal thoughts. The authors did find that burnout was associated with suicidal thoughts (Van Der Heijden et al., 2008).

A study conducted in Taiwan with both physicians and residents found that physicians in different ages and even marriage status reported different levels of burnout when the three domains are studied separately (Chen et al., 2013). For example, 34% of 20-30 years old reported high burnout in the emotional exhaustion domain compared to 5.7% among 51 years and older. And, while 71.3% of married individuals reported high burnout in the personal accomplishment domain, only 27.7% of singles reported the same. Furthermore, high burnout in the emotional exhaustion domain was associated with higher risk of alcohol abuse and making medical errors. This study also found no gender differences in the burnout rate. Finally, about 41.5% residents reported high burnout in the domain emotional exhaustion, 41.3% reported high burnout in the depersonalization domain and about 21.5% reported high burnout in the personal accomplishment domain.

Aksoy et al. (2014) studied the prevalence of burnout among resident physicians in internal medicine and pediatric units in Turkey, a country where there is no work hour limit. They found a third of their resident physicians were suffering from burnout. They also found that the burnout data were not different between these two units. Apart from that, they also found one sixth of the resident physicians were suffering from depression.

A study conducted among resident physicians in Malaysia only through the emotional exhaustion domain found that burnout mean score was highest in obstetrics and gynecology (mean score: 30.2) and lowest in orthopedics (mean score: 21.5) (Al-Dubai et al., 2013). The study also found significant differences in the burnout out score between those who worked 60 hours per week (mean score: 21.7) and those residents who worked 72 hours per week (mean score: 25.3). Various factors were asked in the survey and identified to relate to burnout include: 1) time constraint, 2) work load, 3) lack of incentives etc.

Another study conducted in Iran combining both residents and physicians in emergency medicine department, found that 39% had high depersonalization, 37% had high emotional exhaustion and 46% low personal accomplishment (Jalili

et al., 2013). The authors also incorporated about 38 stressors that might contribute to this burnout by both reviewing literature and conducting focus groups. Some of the stressors discussed in the paper included: 1) lack of support and encouragement, 2) fatigue, 3) fear of malpractice suit etc.

Apart from these resident physicians, another major study conducted by Aiken et al. (2011) among nurses in 9 countries (i.e., USA, China, South Korea, Thailand, Japan, New Zealand, UK, Canada and Germany) found that the rates of burnout among nurses differed from one country to another. For example, South Korea and Japan recorded highest percentage of nurses reporting high burnout, 60% and 58% respectively whereas Germany recorded only 15% of nurses suffering from high burnout. Hospitals rated by the nurses as having better work environment tend to have lower odds of reporting high burnout rates (significant differences compared to hospitals rated poor work environment in 7 out of the 9 countries) and low job dissatisfaction. Finally, a study conducted among nurses in Belgium found that burnout mediated the relationships between environment (e.g., nurse-physician relationship) and job outcomes and nurse-assessed quality of care (Van Bogaert et al., 2009).

2.6 Interventions to reduce burnout among resident physicians

After almost 35 years engaging in burnout research, Maslach et al. (2012) argued that interventions to reduce burnout must not concentrate on the individual-level intervention alone but must move forward to the direction of using the "multi-level models" which recognized that "individuals are embedded in nested organizational entities" (Maslach et al., 2012, p. 299). However, current intervention studies addressing burnout among resident physicians and physicians still overwhelmingly operate at the individual-level. For example, Awa et al (2010) in their literature review of all burnout interventions found that almost 68% of the 25 intervention studies published between 1995 and 2006 to reduce burnout involved individual-level intervention only, another 24% involved both individual and organizational-level interventions and 8% involved organizational-level intervention alone. Their literature review included populations ranging from physicians to police officers. Individual-level interventions in the review mostly involved cognitive behavioral training, counseling, and relaxation while organizational-level interventions included work schedule reorganizations (Awa et al., 2010). 80% of these 25 studies did find significant reduction in burnout (Awa et al., 2010). However, Awa et al. (2010) cautioned that most of these studies have small sample sizes and high dropout

rates. They also strongly recommended future interventionists use the randomized controlled trial (RCT) method to see the effectiveness of the intervention (Awa et al., 2010).

Among those studies that did not use a randomized design, one was conducted with 227 physicians in Norway (only 184 of these physicians answered the final survey) (Isaksson et al., 2010). Counseling was used as the intervention (Isaksson et al., 2010). Data on burnout were collected before the intervention, one-year and three year after the intervention. The study found significant drop in the level of emotional exhaustion (Isaksson et al., 2010).

Krasner et al. (2009) created educational program among primary care physicians. This education program was delivered through 8 weekly 2.5-hour sessions and one long 7-hour session before wrapping up with 10 monthly 2.5 hours sessions (Krasner et al., 2009 p. 1285). During this intervention, the primary care physicians were asked to share a brief story in pairs or small groups on how they experienced and handled burnout. The study found significant reduction on the emotional exhaustion and depersonalization domains of burnout after a year, and

significant improvement in the personal accomplishment domain after a year among these primary care physicians (Krasner et al., 2009).

There have been only two RCT intervention studies conducted to reduce burnout among resident physicians published in English. The first study, which was conducted in Belgium, randomized 96 oncology residents into an intervention group and a control group. The intervention group was given communication and stress management training (Bragard et al., 2010) while the wait-list control group received the intervention at the conclusion of the study. The communication training was about 30 hours while the stress management training was about 10 hours and done in small groups (Bragard et al., 2010). The communication skills were based on communication theory, and the stress management training involved various skills including the ability to identify stress factors and how to manage time (Bragard et al., 2010). Comparing pre and post test results, the authors found that the intervention did not change the prevalence of burnout (Bragard et al., 2010).

West et al. (2014) conducted a RCT intervention to improve physicians' wellbeing including reducing burnout at the Mayo Clinic. They randomized the 74 physicians

in equally into the intervention and control groups. Both groups were allocated an hour per week from their current clinical hours to spend either in the intervention group or in the control group. For the intervention group, 19 sessions using a small group curriculum was administered throughout the two years of the study. The control group could use this one-hour to do activities they deemed as useful. While the differences between the emotional exhaustion domain and overall burnout between the intervention and control groups were small and not statistically significant, there was a large and statistically significant difference in the reduction of high depersonalization in the intervention group compared to the control group.

2.7 Gaps in the Literature

While the construct "burnout" has been studied in terms of its prevalence and risk factors, the risk factors have only included various demographic characteristics or other widely measured constructs such as "depression". These risk factors were generated by the researchers themselves and not by the populations of interest, limiting the identification of other risk and protective factors that might be involved. The inclusion of the resident physicians' voice would help to illuminate factors for burnout from their lived experience. Some of

these factors might overlap with previous discovery and hence further strengthen the already noted factors.

Apart from that, there is a scarcity of intervention studies that try to reduce burnout among resident physicians. Furthermore, these interventions did not take into account the voices of the resident physicians themselves. Instead of rushing toward the suggestion made by Maslach et al. (2012) who recommended concentrating on "multi-level" interventions, we have to hear what the resident physicians themselves prefer. Hence, a study needs to be conducted not only to explore these contributing factors of burnout but also, how these factors are rated for importance and changeability by the resident physicians themselves. Identifying the most important and changeable factors together from the resident physicians' perspective will help us to create future interventions based on their own "lived experience". Finally, how these factors cluster together and relate to each other and with burnout have also not been explored. I will be using Concept Mapping as a method to explore these gaps.

Chapter 3: Methods

3.1 Choosing the Data Collection Method

One of largest gaps in burnout studies among resident physicians is the very limited number of studies examining the factors that influence burnout. If we would like to reduce burnout among resident physicians, it is important for us to understand the factors that contribute to their burnout. Hence, a qualitative method is important in order to generate the factors for burnout. Additionally, the residents themselves should have the opportunity to choose the interventions. A survey, for example, could be used to select the intervention. The Concept Mapping (CM) method was chosen for this dissertation because it is able to do both – identify the factors and the interventions in a single study (Trochim, 1989; Trochim & Kane, 2005).

The term "concept mapping" can be viewed as a process of creating a conceptual framework to explain a phenomenon. This process, of course, is widely used by researchers in order to create conceptual diagrams for their own research questions. However, CM is much more complex than that; it is an integrated mixed-method in which both the qualitative and quantitative data are collected (Trochim, 1989; Trochim & Kane, 2005; Windsor, 2013). It involves a group

coming together to create a structured conceptualization of the phenomenon by working together to answer the specific research question (Trochim & Kane, 2005; Windsor, 2013). Hence, CM is also considered as a form of participatory research (Burke et al., 2005; Windsor, 2013). I chose CM as the method for this dissertation after reviewing the literature as shown in Table 2 and weighing in the flexibility of modes of data collection used in CM. The five studies that were reviewed also studied factors for a phenomenon and interventions for the phenomenon as intended in this dissertation. These studies reviewed also helped to inform how CM has been used in various settings and populations.

Table 2. Selected studies in public health that have used the concept mapping method

Authors	Research Questions/ Focal Question/ Population	Results/ The Utilization of the results
O'Campo et al. (2005)	Lack of studies exploring the roles of neighborhood characteristics and intimate partner violence (IPV). ''characteristics of neighborhoods that could relate in any way, good or bad, to	Neighborhood characteristics which are associated with IPV could be divided into seven clusters: 1) deterioration factors such as poverty; 2) negative social attributes such as violence in the community; 3) violence attitudes and behaviors such as the macho

	Women's experience of IPV.'' (O' Campo et al., 2005, p. 604) Women who might have experienced IPV and not.	culture; 4) stabilization factor such as cultural norm; 5) neighboring monitoring such as calling the police; 6) communication networks such as churches; and 7) community enrichment resources such as women's groups The clusters generated could help to create a multilevel intervention. This includes creating new policies.
Windsor (2013)	Lack of evidence-based interventions involving community to solve substance abuse especially when this community is considered as a "distressed community". "What is the role of drugs and alcohol in Newark's low-income and predominantly African-American neighborhoods?" (Windsor, 2013, p.279) Substance abusers, community residents and service providers for these substance abusers were recruited in Newark, New Jersey	Three large themes emerged from this study. The study concluded that the roles of the drugs and alcohol could be divided into their impacts on each individuals, on drug traders and their players and finally on the communities. There was huge distrust among the community members toward the government and the police. Individuals were in agreement that substance abuse was bad to the individuals and the community but viewed government involvement was

		not motivated by the need to help these communities. Hence, one of the recommendation made by the study included building mutual trust between the police, government and the communities. They also made a point that substance abuse was not an individual problem alone. The findings were published and used to apply for funding which they received to conduct intervention in this population.
Lebel et al. (2011)	Contextual factors are crucial to be understood in order to reduce obesity through diet and physical activities "In your milieu, an element that could influence physical activity and diet is…." (Lebel et al., 2011, p.440) 45 stakeholders between the ages of 45-50 years old who are all French speaking. These individuals worked either as physicians, urban developers, city and neighborhood administrator or principal.	Eight clusters were generated: 1) urban design for physical activity, 2) community mobilization, 3) access and facilities to engage in physical activity, 4) food culture 5) food accessibility, 6) urban design and proximity, 7) household socio-economic situation and 8) life course. When asked to rate these items based on its feasibility and importance, items in the clusters access and facility for physical activity and urban

		design tend to be rated as the most feasible and most important factors. Identifications of these factors that were considered as the most feasible and the most important for intervention.
Brennan et al. (2012)	Identifying the effective strategies to support active living Two questions:"1) what were the facilitators of creating change in environments and policies?" and "2) what policy and environmental changes led to increases in community rates of physical activity?" (Brenna et al., 2012, p.S338) Project staffs funded for the active living based projects and key community partners involved in these projects.	Various clusters were generated including the need to partner and collaborate, to have a sustainable project, to engage in capacity building and making changes to the built environments. Changes to the built and natural environment are considered as the most important intervention approaches while campaigns and promotions as the least important. The rating of the intervention strategies was an interesting finding.
Johnson et al. (2012)	Crucial to understand the ecological factors which could be used to prevent school violence "generate a list of items that describe the characteristics of your school environment that could	Various clusters were generated. These clusters included: 1) school security, 2) school pride, 3) school trust 4) bullying, 5) violence all over and 6) relationships etc.

	relate in any way, good or bad, to a student's experience of violence" (Johnson et al., 2012 p. 94). High school students in an urban setting. There were two groups of these high school students. The first group was 100% African Americans while the second group was 87% African Americans. Only a quarter of the students in each group had faced school violence	The students did take into account the role of the school environment in influencing school violence.

Before finalizing CM, I also considered two other qualitative methods – in-depth interviews and focus groups. In-depth interviews could be useful to help identify the factors for burnout by conducting interviews with the residents. However, this method can be extremely time consuming for residents who have very busy schedules. Focus group is another method that had been thought about because of the busy schedule of the residents. Bringing many residents together at the same time might reduce the number of hours needed compared to the in-depth interview method. Furthermore, this method is powerful in helping to generate collective input with the residents. However, this method would have failed to provide sufficient privacy and space for extremely private and personal factors for burnout to be generated. The CM method was chosen because it addresses these

limitations, and has many additional strengths, including being very feasible for data collection among extremely busy populations such as resident physicians. CM data collection can be done individually and on-line, while at the same time allowing for group input and interaction.

Furthermore, Burke et al. (2005 p. 1408) argued, “concept mapping is a substantially stronger methodological approach for understanding a complex phenomenon than focus groups or in-depth interviews”. This, they argued, is because concept mapping allows the researcher to explore how each theme discovered relates to the phenomenon but also how the themes relate to one another (Burke et al., 2005). Themes that might emerge from focus groups are either a singular theme or a limited number of themes, whereas CM can generate multiple themes. Hence, for my study, I would be able to explore not only the various themes that contribute to burnout (i.e., the phenomenon of interest), but also how each relates to the others. This exploration will further help to generate hypotheses for future studies, and eventually develop new theories to explain burnout (or expand upon existing ones) (Burke et al., 2005).

Here are other strengths of the method that served as the impetus to choose CM:

1) CM allows the study participants to help generate the factors, sort and rate them and finally interpret the results. Hence, the residents would participate throughout the three phases of this study.

2) CM allows for the generation of factors using multiple modes of data collection. This means factors can be generated through individual interviews, focus groups, and a simple process of having participants individually list them on a piece of paper. This is extremely important as resident physicians are very busy individuals and hence having multiple modes of data collection allow for more options to choose from. This method, therefore, could be adapted to the needs of the resident physicians.

3) CM helps participants and the researcher visualize how the generated factors relate to each other. Hence, the factors generated are not just identified, but also analyzed further to explore their relationships. This is done during the sorting process.

4) The method allows for the solutions to be identified based on the factors generated. The solutions or the interventions identified are based on the factors generated by the residents in phase 1.

5) The method also allows for comparisons to be made between two residency programs. This is crucial as forms of contextualization and triangulation of the data.

6) The residents are involved in interpreting the results. Their voices helped to shape the discussion and to identify appropriate interventions to pursue.

Once the CM was chosen, I attended CM training in Ithaca, New York from July 13th to July 15th 2015, which was funded by the Department of Health, Behavior and Society at the Johns Hopkins Bloomberg School of Public Health and the Armstrong Institute for Patient Safety and Quality. The training was helpful in understanding how the method should be used in my own doctoral dissertation. During this training, the modes of data collection for my own dissertation were also discussed with CM experts for their opinions and approvals. The training also helped to better understand the CM online website.

CM online website found at the link conceptsystemsglobal.com could be used to conduct the study entirely online. After learning how to conduct and analyze the sorting data, I decided to conduct the sorting activity online because it was much more flexible for the residents themselves to sort the factors online wherever and

whenever they wanted. Initial discussions were had with the advisor whether the rating activity should be done online but this was only finalized after an IRB amendment when some residents who had very busy schedule preferred to do the rating online.

3.2 Focal Question for this Dissertation

In CM, there is one focal question guiding the entire process. The focal question for this dissertation is:

"What are the factors, good and bad, that influence burnout among resident physicians?"

This focal question is the anchor question that helps to answer the specific aims for this dissertation. This question was asked to residents in two different programs: internal medicine and emergency medicine at Johns Hopkins. The next section describes the study population and CM methods in much more detail.

3.3 Study Participants and CM Phases

Resident physicians from two specialties at the Johns Hopkins Hospital were recruited to participate in this study: 1) emergency medicine (EM) and 2) internal medicine (IM). At the time of this research, the emergency medicine residency at

Johns Hopkins was on average four years in duration with 48 residents, and the internal medicine residency was three years (with an additional extra year for internal medicine residents pursuing pediatric training) with about 160 residents. Any resident in either of these programs was eligible to participate in the study. Prior to conducting the study, I asked a permission to conduct this study from Dr. Sanjay Desai who was the program director for the Internal Medicine residency program and Dr. Linda Regan who was the program director for the Emergency Medicine residency program. Both were supportive of the study. After acquiring their support and getting the approval from the Johns Hopkins School of Public Health Institutional Review Board (IRB # 00006438), the study was initiated through three phases, as listed in Table 3.

Table 3. Description of Each Phase

Phase	Description
1	In response to the focal question, generating factors that influence burnout among resident physicians
2	1) Sorting these factors to generate clusters 2) Rating the factors based on importance and changeability

3	Interpreting the data generated from phase 2

It is crucial to note that residents could join the study in all three phases or at different phases. So, for example, a resident might be newly recruited during phase 2 even when he or she has not completed phase 1. So, the number of residents participating throughout all three phases might be different. It is recommended by Kane & Trochim (2007 p. 11) to have about 8 to 15 participants in each study. Previous studies have recruited 14 participants for phase 1, 37 participants for phase 2, and 20 individuals for phase 3 (O'Campo et al., 2005) to 20 individuals continuously participating in all three phases (Johnson et al., 2012). So, for this dissertation, we aimed to have 8 to 15 residents from each specialty in phases 1 and 2 and about 2 to 8 residents from each specialty in phase 3. With intense recruitment efforts, the study managed to recruit 52 residents (22 emergency medicine, 30 internal medicine) who completed at least one phase of the study.

3.4 Participant Recruitment, Consent, and Demographic Survey

Recruitment of the resident physicians took place from August of 2015 to June of 2016 through 1) their list serves, 2) their weekly or monthly meetings, and 3)

direct face to face recruitment. Multiple emails were sent to both IM and EM residents about the study through their respective list serves; 18 IM residents and 9 EM residents were recruited through this method. 12 IM residents were directly recruited when I got the opportunity to meet them in person at the IM resident lounge, and 13 EM residents were recruited during their weekly Friday meeting at the Mount Washington Conference Center.

Only IM and EM residents from year 1 to year 4 at the Johns Hopkins Hospital were eligible to participate in this study. The eligibility criteria and the definition of burnout were mentioned: 1) in the recruitment email sent only to the list serve of IM and EM residents at the Johns Hopkins Hospital, 2) in both the IM monthly meeting and EM weekly meeting and 3) during face-to-face meetings. Residents typically replied to the recruitment email or sent a text if they wanted to participate in this study when emails were sent.

Once the eligibility had been affirmed, they were given a study ID. Oral consent form, demographic survey (please see Appendix A) and factor listing form (please see Appendix B) were sent to the residents through emails or given to them directly if we met face-to-face. The residents consented by saying they agreed to

participate in the study verbally, through text or email. Table 4 shows the participants in various phases of the study whereas Table 5 shows the total participation in each phase.

Table 4. The Participation in Various Phases of the Study

Phase	Overall (n)	IM (n)	EM (n)
1 only	1	0	1
2 only*	24	14	10
3 only	1	0	1
1 and 2* only	19	12	7
1 and 3 only	0	0	0
2 and 3 only	2	0	2
1,2* and 3	5	4	1

*Participated in at least one activity in Phase 2.

Table 5. Total participation in Each Phase

Phase	Overall (n)	IM (n)	EM (n)
1	25	16	9
2*	50	30	20
3	8	4	4

*Participated in at least one activity in Phase 2.

Out of these 52 residents, only 44 submitted their demographic survey. This demographic survey contained five questions as shown in Table 6. The questions were decided based on the analysis plans and informed by literature.

Table 6. The Five Demographic Questions Asked

Demographic	Question	Type	Options
Specialty	What is your specialty?	Categorical	Internal Medicine/ Emergency Medicine
Year	What year of residency are you currently in?	Categorical	Year 1/Year 2/ Year 3/ Year 4
Gender	What is your gender?	Categorical	Male/Female/ Other
Married	Are you married?	Categorical	Yes/No
Important	Is burnout an important issue in your specialty at Johns Hopkins?	Categorical	Yes/No

The first and second demographic questions about the specialty and year are important because those questions helped to inform their specialty and their year

in the residency program. These data help to compare and contrast the results obtained from these two specialties. The third and fourth demographic questions were informed by the literature as many studies have shown gender and marital status as having influences on the residents' burnout (Garza et al., 2004; Afzal et al., 2010). Finally, the last question was created in order to capture the sense of burnout issue in each specialty. This question helps to understand whether burnout is even an important issue within each specialty. No question was created to ask the residents whether they themselves are facing burnout. Table 7 shows the complete demographic data.

Table 7. The Demographic Data of the 52 Study Participants who Participated in any of the Three Study Phases

Demographic	Options	#	%
Specialty*	Internal Medicine	30	57.69
	Emergency Medicine	22	42.31
TOTAL		52	100
Year	Year 1	9	20.45
	Year 2	20	45.45
	Year 3	9	20.45
	Year 4	6	13.64
TOTAL		44	100

Gender	Male	28	63.64
	Female	16	36.36
	Other	0	0
TOTAL		44	100
Married	Yes	23	52.27
	No	21	47.73
TOTAL		44	100
Is burnout an Important issue in your specialty?	Yes	40	90.91
	No	4	9.09
TOTAL		44	100

* Only 44 residents submitted their demographic data. 8 extra residents' specialties were identified based on their study ID.

3.5 Phase 1 Data Collection

A total of 25 residents (16 IM and 9 EM) listed factors for burnout on a form given to them (Appendix B). The listing was done either during face-to-face meeting or through email. The mode of data collection was chosen because it was extremely hard to gather the residents in one setting in order to brainstorm the factors. Additionally, the form also allowed residents to list factors that they might

consider as quite personal and therefore not shared in a setting with their peers. The form asked the residents to list all the factors, good and bad, that influence burnout among resident physicians and hence the focal question is emphasized on the form itself. Most residents listed factors in short sentence fragments such as “long hours”, “physical health” and “ lack of rest”. However, some residents did write short narratives explaining each factor they listed with examples from their own experience as residents.

These factors were later compiled in an excel file and examined with the thesis advisor, Dr. Gielen, and the CM method expert, Dr. Lindstrom-Johnson. Taken together, the 16 IM residents generated 209 factors and 9 EM residents generated 179 factors. Both the thesis advisor and I read through factor generated by IM residents and dropped duplicate factors and combined similar factors. We generated keywords or phrases describing similar factors. Next, the 179 factors generated by the EM were later carefully examined by using the keywords generated from the IM residents factor. After examining the factors generated by EM residents, we concluded the factors for burnout generated by both IM and EM residents were qualitatively similar. Therefore, we agreed to combine both residencies’ lists of factors together. This process was done to

create a unified and parsimonious list that would limit the participant burden; this is considered “unitizing” or generating multiple singular factors to be sorted and rated by the participants (Jackson & Trochim, 2002). It is recommended to have a maximum of 100 factors in order to reduce the burden to participants (Trochim, 1989). For our study, we realized that residents might not have the time and energy to sort and rate over 100 factors. An example of unitizing to reduce the number of factors is “social support from family” and “social support from friends”, which were listed by some of the residents as two different factors or combined as a single factor by other residents. The thesis advisor and I discussed whether social support from family might be different than social support from friends. Given the number of factors and the fact that multiple participants listed them together as a single factor, we ultimately decided to combine them. Hence, we did our best to combine factors, and ultimately reduced the 388 factors to 71 factors that were to be sorted and rated in Phase 2. No new factors from the literature were added.

3.6 Phase 2: Sorting and Rating Data Collection

After the factors were generated, these factors were inputted into the Concept System online website at the conceptsystemsglobal.com for sorting and rating. A

paper and online survey for rating was also created for residents (please see Appendix C). A total of 41 residents (26 IM residents and 15 EM residents) completed the sorting, and each resident was asked to sort the items into piles through the Concept System website (conceptsystemsglobal.com). I brought my laptops and paper survey to meet the residents directly or emailed them the link to the sorting and rating activities (the link could be accessed on conceptsystemsglobal.com with their email address and password given to them in the email). When met face-to-face, the residents sorted the factors using the CM online website at the conceptsystemsglobal.com on my laptop.

There are two rules followed for sorting: 1) each pile should not have a single factor and 2) all items should not be placed in a single pile. Participants are also asked to give a label to each of the piles. The Concept System online website uses these grouped data to generate a point map using multidimensional scaling. A point map consists of each item being located as a single point in the X-Y coordinate graph, based on the grouping done previously by the study participants. Items that have been grouped/piled together by the study participants will be located closer to each other in the X-Y coordinate graph. The

generation of the point map using multidimensional scaling follows the following steps (Kane & Trochim, 2007):

Step 1.: Once sorted, the factors are placed in a similarity matrix. Imagine a resident who sorted five factors into two different piles – the first pile contains factor 1 and factor 5 while the second pile contains factors 2,3 and 4. The similarity matrix will record these sorting as shown in Table 8.

Table 8. Binary Symmetric Similarity matrix

Factors/Factors	1	2	3	4	5
1	1	0	0	0	1
2	0	1	1	1	0
3	0	1	1	1	0
4	0	1	1	1	0
5	1	0	0	0	0

The top row and the left column represent the factors' number. In this hypothetical case, there are five factors so the factors are given number 1 to 5. Given that the resident sorts factors 1 and 5 together, the column 1, row 5 and column 5, row 1 will be given the binary value of 1. Factors that are not sorted together will receive the binary value of 0. This process is completed for 71 factors. The aggregated data of 41 sorters will generate the group similarity matrix.

Step 2: Next, two-dimensional nonparametric multidimensional scaling is used to generate a point map (Kruskal & Wish, 1978). Factors that are constantly sorted in a similar pile will be closer together in a X-Y graph whereas factors that are sorted constantly in different piles will be far away in a X-Y graph (Kruskal & Wish, 1978; Kane & Trochim, 2007). The distance between each factor is done iteratively to generate the final coordinates of each factor on that X-Y graph (Kruskal & Wish, 1978; Kane & Trochim, 2007).

Based on the input of the similarity matrix and the output produced by the point map, stress values are measured. This stress value indicates the fit of the input model and the output model. The lower the stress value, the better the model fits (Kruskal & Wish, 1978).

Step 3: The point map data are later aggregated together into clusters using hierarchical cluster analysis. Hierarchical cluster analysis helps to aggregate factors on the point map into clusters (Kane & Trochim, 2007). Ward's algorithm is used to minimize the total square distance between points in order to generate clusters. Kane & Trochim (2007 p.101) have said that "there is no single 'correct' number of clusters, and there is no mathematical way to select this

automatically". So, the decision to determine the number of clusters is based on examining the factors within each cluster. We tried from four to 11 clusters and examined the factors within each cluster. Five cluster factors were chosen because each cluster contained qualitatively similar factors within it. This decision was made with the help from CM method expert, Dr.Lindstrom-Johnson.

Step 4: The CM online website did generate label names for four out of the five clusters based on the names given by the residents themselves. However, discussions were also held with the Dr. Lindstrom-Johnson to explore a much more comprehensive label for each cluster. Based on her suggestion, three different clusters were renamed – 1) from "financial" to "Quality of work life", 2) from "no.7" to "coping strategies", 3) from "work relationship" to "work environment". Furthermore, Dr. Sallie Weaver, who is trained as an industrial psychologist, suggested the label name "professional satisfaction" for the "job satisfaction" cluster. Only the label name "patient factor" was not changed.

Finally, once they were done with the sorting, they would rate the factors on a paper survey given to them. Residents who chose to complete the sorting and rating activity online did so using the link sent to them. The residents rated (on

paper and online) each of the 71 factors on two dimensions: “importance” and “changeability” (survey as shown in Appendix C). A Likert scale was used in this survey with 5 indicates most changeable, 3 indicates moderately changeable, and 1 indicates least changeable (2 and 4 were not labeled). Likewise, for the “importance”, 5 indicates most important, 3 indicates moderately important, and 1 indicates least important (2 and 4 were not labeled). A total of 47 residents (29 IM residents and 18 EM residents) rated the factors for “importance” and 49 residents (30 IM residents and 19 EM residents) rated the factors for “changeability”. The paper survey data were manually entered into the CM online website.

The average rating of each factor is later mapped on an X-Y graph with the X-axis indicating the “importance” and the Y-axis indicating the “changeability”. This graph is called the Go-Zone map. The mean score for the “importance” and “changeability” ratings for all of the factors and for the total sample was used to divide the map into four different zones (Kane & Trochim, 2007). The top right zone is called the Go-Zone area. Factors in this Go-Zone area are considered as factors that could be addressed through interventions because they were scored as high in both importance and changeability.

Additionally, cluster average rating (the average mean scores of all the factors in a cluster) is also used to generate a Pattern Match. Pattern Match allows us to identify clusters based on their average "importance" and "changeability" mean scores. The mean scores are absolute mean values that are used to rank the clusters. A Pattern Match also provides the R-value or the correlation value between the "importance" and "changeability" mean scores of the clusters.

3.7 Phase 3 Data Collection

A total of 8 resident physicians (4 IM residents and 4 EM residents) participated in Phase 3 to interpret the results from Phase 2 and to help identify interventions based on the data produced. They were recruited directly while participating in the previous two phases at the IM resident lounge (4 IM residents) or during the EM weekly meeting (4 EM residents). 4 of these IM residents and 1 EM resident had participated in both phase 1 and phase 2 while 2 EM residents had participated in phase 2 alone. Only 1 EM resident had not participated in either phase 1 or phase 2 but was aware about the study from previous EM weekly meeting recruitment and list serve recruitment emails. Three different sessions were conducted with the residents given that it was almost impossible (i.e., residents work an average of 80 hours per week and have diverse schedules) to

bring the residents together at the same time in one setting. These sessions lasted for about 30 to 50 minutes. These sessions were held at the IM Resident Lounge and at the Mount Washington Conference Center. Using point slides, I showed the definition of burnout, the cluster map generated in this study, Pattern Matching and factors identified in Go-Zone areas. A script was used to facilitate the discussion and the questions asked to them included: 1) do they understand the definition of burnout? ; 2) what do they think about the cluster maps? ; 3) how do these clusters relate to burnout?; 4) what do they think about the four intervention identified as the most important and most changeable?; and 5) what do they think about the pattern match?

Chapter 4: Results

In this chapter, results of the study will be presented by answering each specific aim. There are four specific aims for this as noted in Chapter 1: 1) to identify factors, good and bad, that influence burnout among resident physicians; 2) to generate clusters of factors by combining similar factors in clusters; 3) to identify the most important and changeable factor(s) and clusters that contribute to burnout among these resident physicians; and 4) to compare results between the IM and EM residents.

4.1 Results for Specific Aim #1: Identify factors that influence burnout

After removing duplicates and combining similar factors, 71 factors that influence burnout among resident physicians were identified. Both EM residents and IM residents generated qualitatively similar factors. Hence, the factors that influence burnout among EM and IM residents are concluded to be very similar. These factors are shown in Table 9. The same factor numbering system is used throughout the rest of the analyses.

Table 9. Factors that influence burnout among resident physicians (N= 9 Emergency Medicine and 17 Internal Medicine Residents)

Number	Factors that influence burnout among resident physicians
1	Dealing with loss of a patient, highly emotional care situations, bad outcomes
2	Relationships with co-residents
3	Low pay
4	Patients who need detailed explanations
5	Feeling of accomplishment after a successful diagnosis or treatment
6	Commute to work
7	Relationships with supervising residents
8	Healthy Diet
9	Financial stress
10	Not enough time to provide adequate patient care
11	Physical health
12	Working long stretches of time without a day off
13	Job satisfaction
14	Work-life balance
15	Doubts about the decision to be a medical doctor
16	Opportunities to voice concerns
17	Mentorship
18	An undemocratic work culture
19	Having attendings who like teaching
20	Paperwork and administrative responsibilities
21	Facilities (i.e., resident work rooms, lounges)
22	Interaction with faculty/attendings
23	Feeling like your work is appreciated
24	Feeling support from administrators
25	Having Pets
26	Attendings who berate residents
27	Large knowledge base to master
28	Lack of time for myself (e.g., to engage in hobbies)
29	Amount of daily obligations and responsibilities
30	Limited institutional resources
31	Vacation time
32	Delaying other life goals due to residency

33	Lack of positive feedback from patients
34	Difficulties interacting with other services and departments
35	Mental health
36	Being able to exercise
37	Doubts about actually helping patients
38	Lack of sleep
39	A culture that accepts rudeness
40	Quality time with partner/significant other
41	Pressure to find employment post-residency
42	Medicine's inability to fix deep social issues
43	Strained relationships with nurses
44	Opportunities for involvement in QI, research, and teaching
45	Negative interactions with staff
46	Patients bouncing back to the hospital
47	Confrontational patients
48	Lack of benefits
49	Long hours at the hospital
50	Drug-seeking patients
51	Social isolation
52	Hospital reputation
53	Social support from family and friends
54	Joy at work
55	Medically complicated patients
56	Lack of schedule flexibility
57	Lack of time for friends and family
58	Lack of rest
59	Non-compliant patients
60	Patients who don't want treatment
61	Residents' location in the hierarchy
62	Attendings with unrealistic expectations
63	Feeling like the work makes a difference
64	Poor technological and administrative support
65	Patient volume
66	Making mistakes
67	Meditation/spirituality
68	Volunteer work

69	Shift work schedule
70	A culture of patient-centered care
71	A culture of high expectations for achievements

4.2 Results for Specific Aim #2: Generate clusters of factors

The sorting of the factors generated a five- cluster solution as shown in Figure 1. These five clusters are: 1) “patient factors”; 2) “professional satisfaction”, 3) “work environment”, 4) “qualify of work life” and 5) “coping strategies”. As seen in Table 10, “patient factors” included items such as “non-compliant patients”, “drug seeking patients”, “confrontational patients” etc. that depict various characteristics and actions of patients that influence burnout. “Profession satisfaction” cluster includes factors such as “joy at work” and “medical error”; the “work environment” cluster includes factors such as “an undemocratic work culture” and “mentorship”, the “quality of work life” cluster includes factors such as “social isolation” and “long hours at the hospital” and the “coping strategies” cluster includes factors such as “healthy diet”, “social support from family and friends” and “lack of sleep”.

Another data that could be seen in Table 10 is the bridging values. The bridging values measured from 0 to 1 could be viewed as how closely each factor is sorted similarity to each other with 0 being most similar and 1 most dissimilar or far away from each other. The “patient factors” and “coping strategies” recorded the lowest bridging values whereas “professional satisfaction” recorded the highest bridging value. Detailed factors in each cluster are shown in Table 10.

Figure 1. Cluster Map

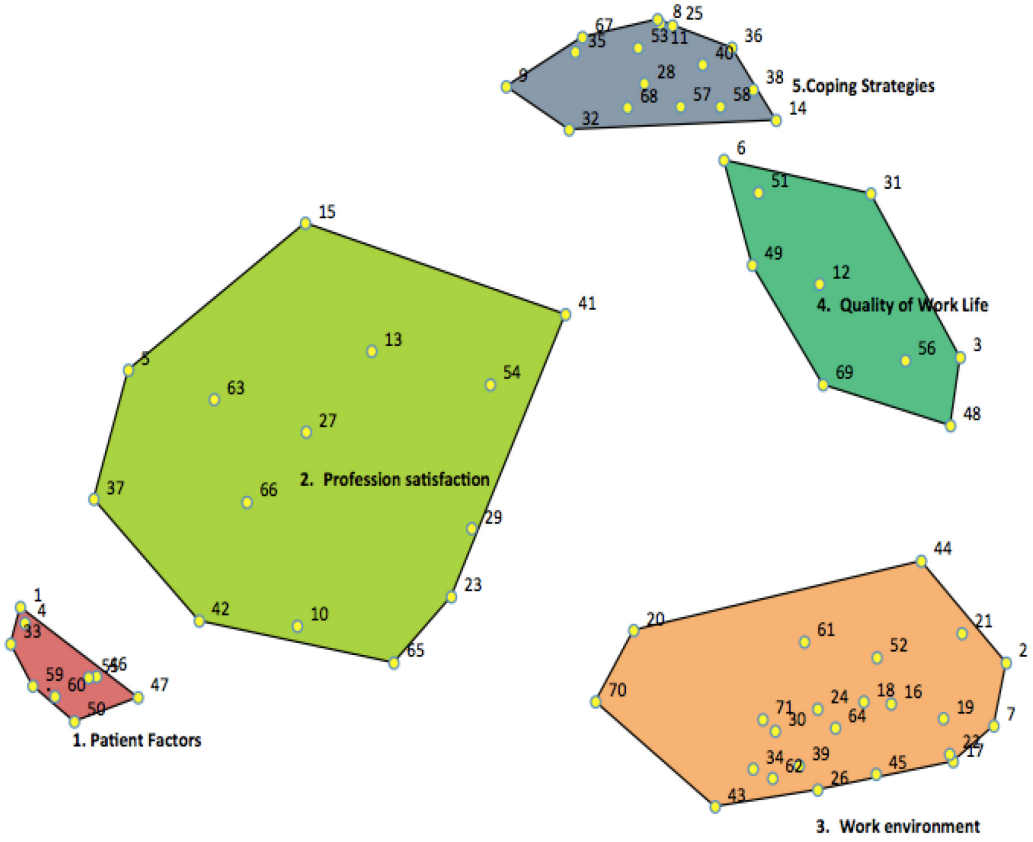


Table 10. Clusters and bridging values

Cluster # and Name	Factor #	Factor	Bridging Value
1. Patient Factors			0.39
	59	Non-compliant patients	0.28
	60	Patients who don't want treatment	0.28
	50	Drug-seeking patients	0.33
	46	Patients bouncing back to the hospital	0.35
	33	Lack of positive feedback from patients	0.36
	4	Patients who need detailed explanations	0.41
	47	Confrontational patients	0.42
	55	Medically complicated patients	0.44
	1	Dealing with loss of a patient, highly emotional care situations, bad outcomes	0.60
2. Profession satisfaction			0.73
	41	Pressure to find employment post-residency	0.58
	42	Medicine's inability to fix deep social issues	0.61
	29	Amount of daily obligations and responsibilities	0.61
	54	Joy at work	0.63
	23	Feeling like your work is appreciated	0.66
	10	Not enough time to provide adequate patient care	0.70
	13	Job satisfaction	0.70
	65	Patient volume	0.74
	66	Making mistakes	0.74
	27	Large knowledge base to master	0.75
	37	Doubts about actually helping patients	0.77
	63	Feeling like the work makes a difference	0.83
	15	Doubts about the decision to be a medical doctor	0.89
	5	Feeling of accomplishment after a successful diagnosis or treatment	1.0
3. Work			0.26

environment			
	18	An undemocratic work culture	0.11
	45	Negative interactions with staff	0.11
	39	A culture that accepts rudeness	0.12
	16	Opportunities to voice concerns	0.12
	64	Poor technological and administrative support	0.12
	30	Limited institutional resources	0.14
	26	Attendings who berate residents	0.15
	24	Feeling support from administrators	0.21
	34	Difficulties interacting with other services and departments	0.21
	22	Interaction with faculty/attendings	0.21
	19	Having attendings who like teaching	0.22
	62	Attendings with unrealistic expectations	0.22
	71	A culture of high expectations for achievements	0.24
	61	Residents' location in the hierarchy	0.26
	52	Hospital reputation	0.27
	17	Mentorship	0.29
	43	Strained relationships with nurses	0.33
	7	Relationships with supervising residents	0.34
	21	Facilities (i.e., resident work rooms, lounges)	0.36
	20	Paperwork and administrative responsibilities	0.46
	2	Relationships with co-residents	0.48
	44	Opportunities for involvement in QI, research, and teaching	0.55
	70	A culture of patient-centered care	0.58
4. Quality of Work Life			0.48
	6	Commute to work	0.26
	51	Social isolation	0.32
	49	Long hours at the hospital	0.41
	31	Vacation time	0.43
	12	Working long stretches of time without a day off	0.47

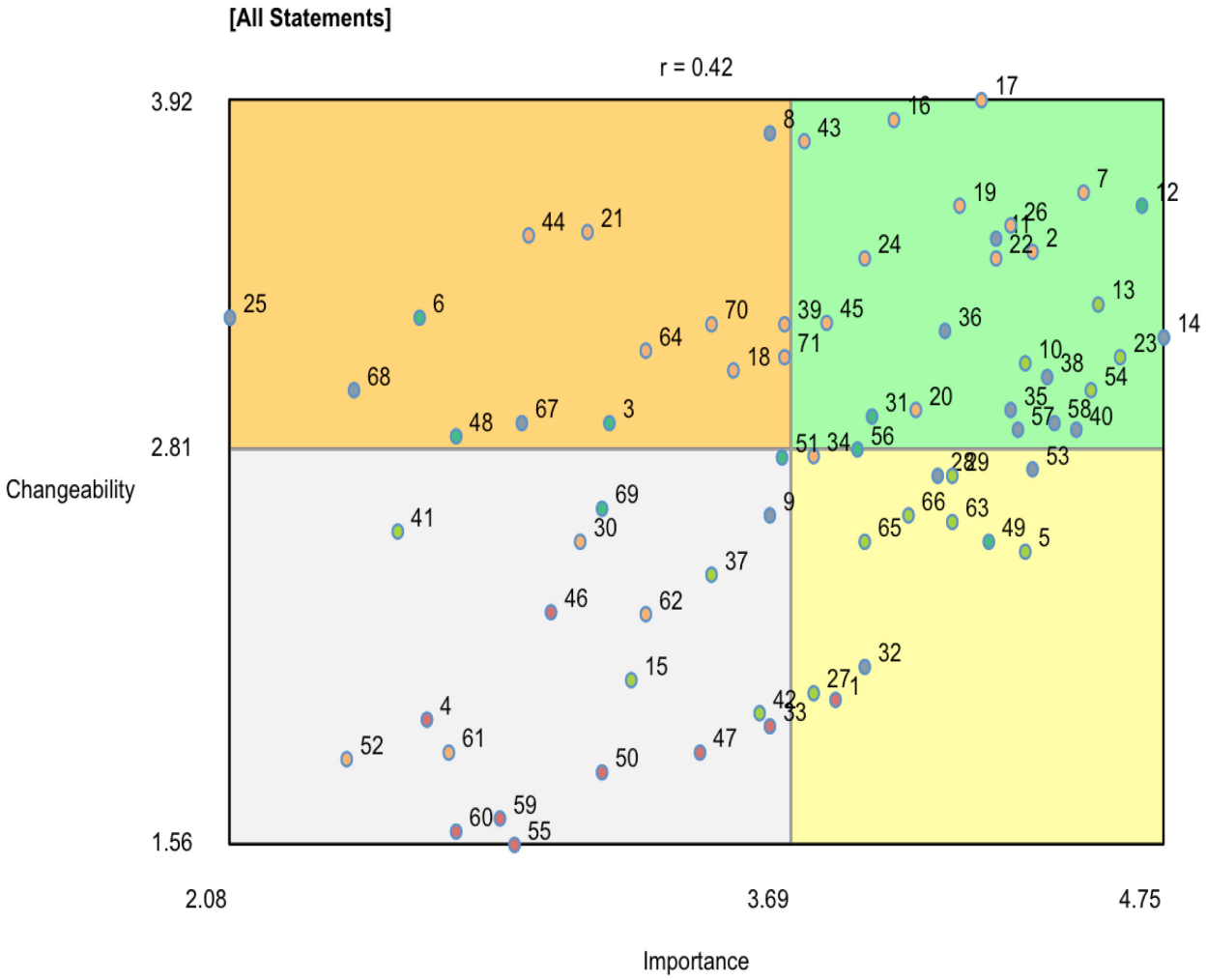
	69	Shift work schedule	0.52
	56	Lack of schedule flexibility	0.58
	48	Lack of benefits	0.65
	3	Low pay	0.72
5. Coping Strategies			0.14
	25	Having Pets	0
	40	Quality time with partner/significant other	0.01
	11	Physical health	0.02
	8	Healthy Diet	0.03
	36	Being able to exercise	0.06
	28	Lack of time for myself (e.g., to engage in hobbies)	0.06
	57	Lack of time for friends and family	0.08
	38	Lack of sleep	0.1
	58	Lack of rest	0.1
	53	Social support from family and friends	0.11
	67	Meditation/spirituality	0.14
	35	Mental health	0.16
	68	Volunteer work	0.18
	14	Work-life balance	0.19
	32	Delaying other life goals due to residency	0.27
	9	Financial stress	0.66

4.3 Results for Specific Aim #3: Most important and changeable factors

A total of 47 residents (29 IM residents and 18 residents) rated the factors for "importance" and a total of 48 residents (30 IM residents and 18 EM residents) rated the factors for "changeability". The average mean rating for clusters and factors within the clusters for both IM and EM could be found in Appendix E.

Figure 2 shows the Go-Zone map. The different colors used to divide the quadrant does not represent anything – they serve as mere contrast for each quadrant. However, the color of each factors is representative of its cluster. As in Figure 1 – the light purple color represent the “coping strategy” cluster, the dark green represents the “quality of work life” cluster, light green represents “profession satisfaction”, orange represents “work environment” and finally red represents “patient factors”.

Figure 2. Go-Zone Map



Top four factors with the most “importance” and most “changeable” were identified from the Go-Zone. Based on discussion with Dr. Lindstrom-Johnson, we agreed to generate four concrete examples of interventions to discuss in Phase 3. These four top factors are listed in Table 11.

Table 11. Four Top Factors

Factor #	Factor	Cluster
12	Working long stretches of time without a day off	Quality of Work Life
17	Mentorship	Work Environment
7	Relationships with supervising residents	Work Environment
16	Opportunities to voice concerns	Work Environment

Additionally, the cluster rating maps were also generated based on “importance” rating and “changeability” rating. Figure 3 shows the cluster rating maps based on the “importance” rating. The numbers of layers as shown in the legend represent the average “importance” rating. For example, the “patient factors” cluster only has one layer and its average “importance” mean rating is between 3.13 and 3.29 across all factors. From the map in Figure 3, we could conclude that the clusters “profession satisfaction” and “ coping strategies” had high average “importance” rating. Similar cluster rating map on changeability is shown in Figure 4. Similar to

cluster rating map for “importance”, the layers represent the average rating score across all the factors included in that cluster

Figure 3. Cluster Rating Map for “Importance”

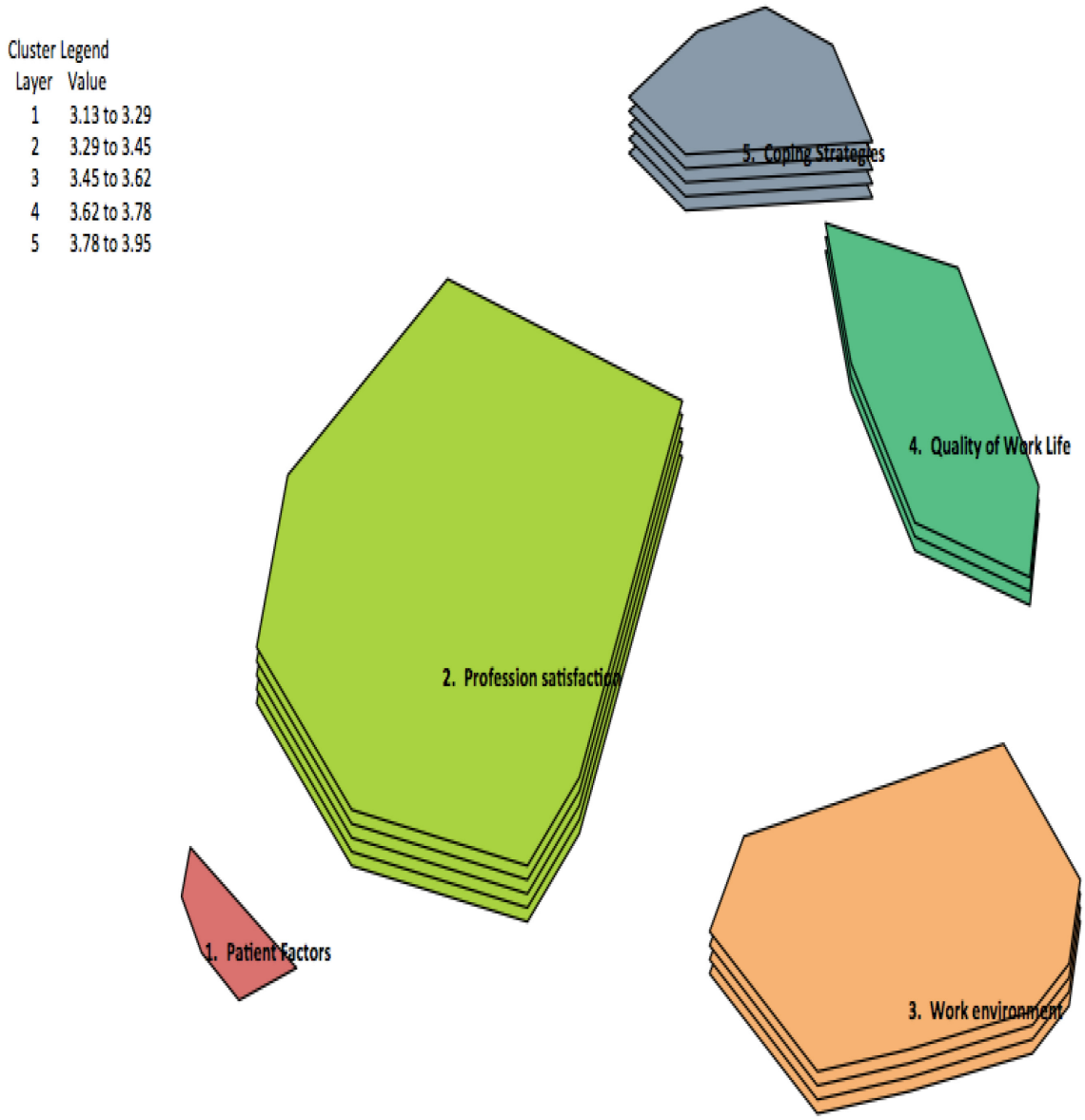
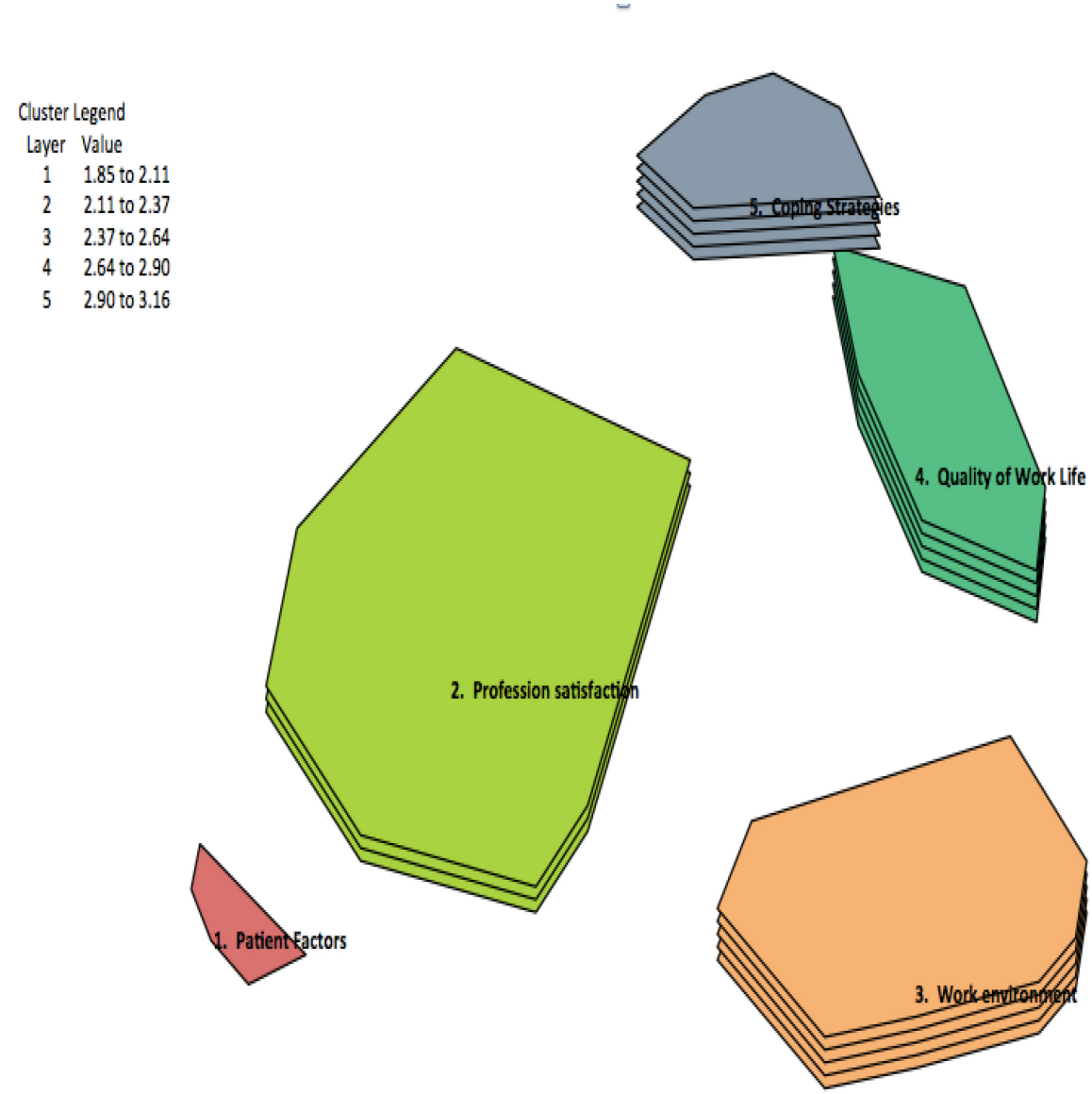


Figure 4. Cluster Rating Map for "Changeability"



Finally, Pattern Matching was also generated. Pattern Matching transformed the cluster rating into a ladder form where each cluster is ranked based on their "importance" and "changeability" average mean scores. Pattern Matching allows us to consider how each cluster is ranked for "importance" and "changeability". Figure 5 shows the Pattern Matching. The correlation between the "importance" rating and "changeability" is r=0.69 which indicates high correlation between "importance" and "changeability". Work environment cluster is seen as the most changeable even though profession satisfaction cluster was rated as the most important contributor to burnout. The patient factors cluster recorded lowest importance and changeability value among the residents.

Figure 5. Pattern Matching

4.4 Results for Specific Aim #4: Similarities and Differences among IM and EM residency Programs

The factors for burnout generated by IM and EM residents are similar. This is why we have decided to combine their factors. Their cluster rating data showed no statistically significant differences based on the t-test conducted. These data are

found in Table 12. Additionally, the average mean rating based on other demographic variables such as gender was also compared and found not to have any statistically significant differences (please see Appendix F).

Table 12. Comparison of Cluster Ratings of IM and EM Residency Program

Clusters	Variables	Internal Medicine			Emergency Medicine					
		M	SD	n	M	SD	n	t	df	p
1. Patient Factors	Importance	3.0734	0.1570	9	3.2047	0.1474	9	-0.7140	16	>0.05
	Changeability	1.7658	0.0593	9	1.9938	0.0483	9	-2.0850	16	>0.05
2. Profession Satisfaction	Importance	3.9506	0.3439	14	3.9398	0.3149	14	0.0498	26	>0.05
	Changeability	2.5433	0.1891	14	2.7063	0.1673	14	-1.0215	26	>0.05
3. Work environment	Importance	3.6401	0.3057	23	3.6888	0.3370	23	-0.2913	44	>0.05
	Changeability	3.2227	0.3970	23	3.0556	0.2327	23	1.0099	44	>0.05
4. Quality of Work Life	Importance	3.4654	0.5075	9	3.7076	0.3928	9	-0.7658	16	>0.05
	Changeability	2.9182	0.0750	9	2.9074	0.1625	9	0.0665	16	>0.05
5. Coping Strategies	Importance	3.9095	0.6480	16	3.8553	0.4649	16	0.2055	30	>0.05
	Changeability	2.8792	0.1633	16	3.1354	0.1115	16	-1.9549	30	>0.05

Pattern Matching for both IM and EM residents are shown in Figure 6 and Figure 7. Here too there were so few differences in the rankings and pattern matching results between the IM and EM residents.

Figure 6. Pattern Matching for IM residents (N= 29 for “Importance” and N=30 for “Changeability”)

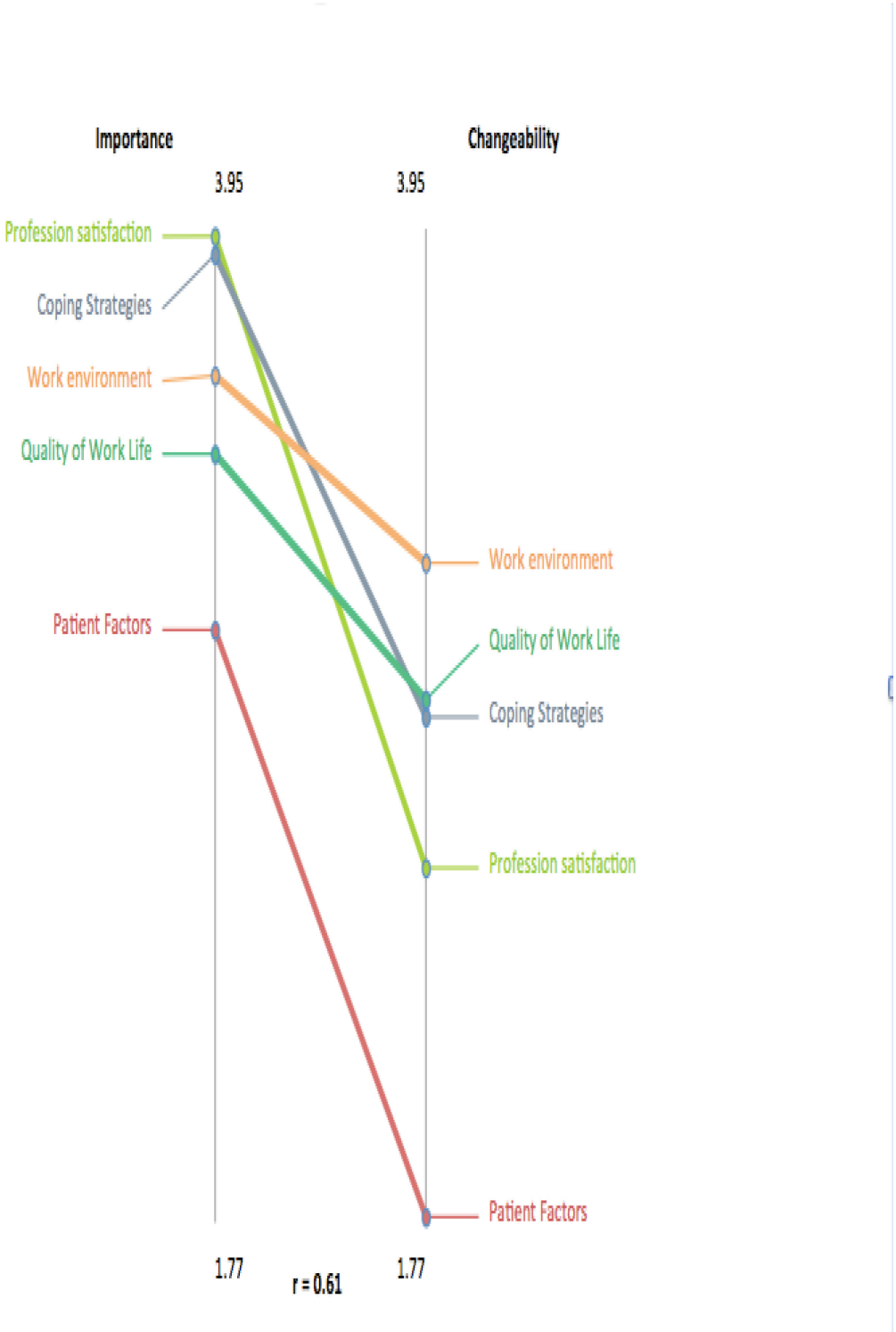
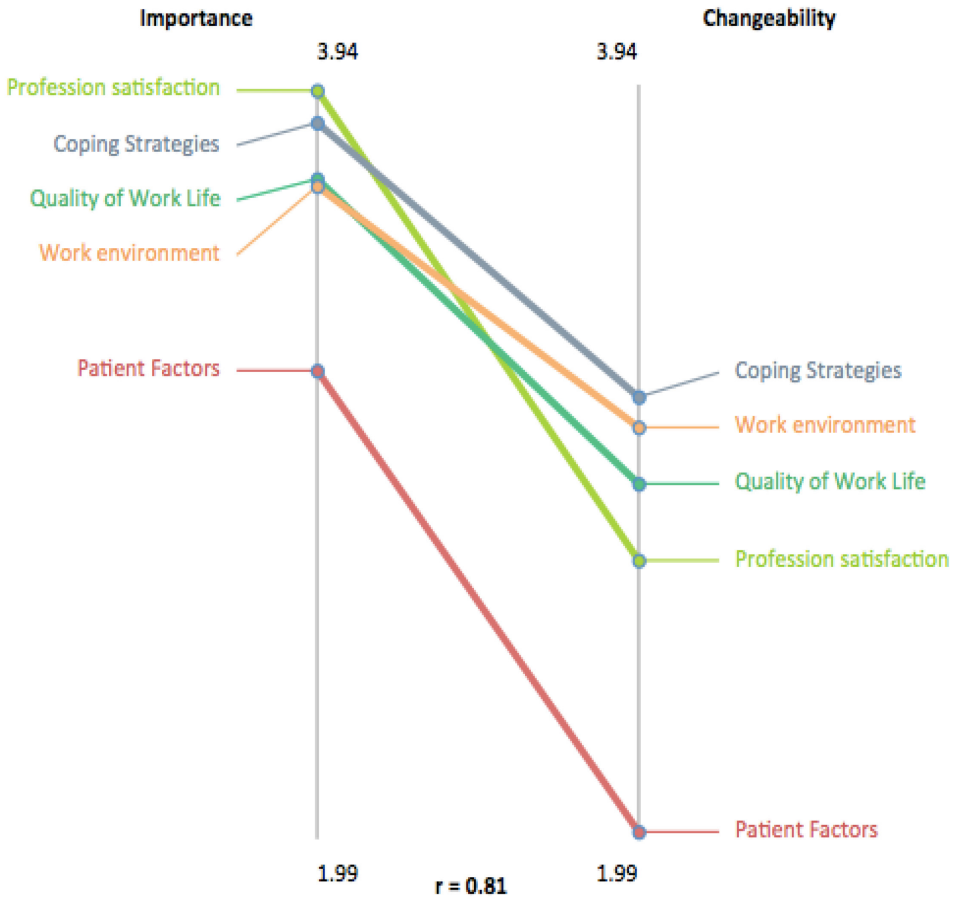


Figure 7. Pattern Matching for EM residents (N= 18 for both "Importance" and "Changeability")



The results from phase 2 in this dissertation were presented to 8 of participating residents for their interpretations. There are many similarities and differences that were identified during these sessions.

4.4.1 Burnout

During the conversation in Phase 3, both IM and EM residents indicated that they were aware of the term “burnout” as it is widely used by their colleagues and they felt there was a high prevalence of burnout among residents at Johns Hopkins, as well as among nurses. Residents also noted that burnout is an “inevitable” part of their residency training. Residents did consider burnout as an important component and consequence of a rigorous training. And, this rigorous training is extremely crucial in transforming them into becoming good medical doctors. Residents argued that Johns Hopkins residency program is known for its “hard-nose program”, and hence every resident at this institution is bound to experience burnout. They also indicated that not all burnout had debilitating effects on them and they could handle low level of burnout easily.

4.4.2 Comparing Prevalence of Burnout in Different Residency Programs

EM residents viewed themselves as having fewer burnout cases compared to IM residents. They noted that EM residents tend to work 60 hours a week compared to IM residents who work an average of 80 hours per week. These EM residents viewed long hours as the most powerful contributor to burnout. Additionally, IM residents did indicate that their residency program is a tougher place to be in than pediatric residency. This comparison is made because there are IM residents who are working in both IM and pediatric departments. EM residents also said that surgery residents have the worst cases of burnout compare to all other residency programs. They concluded this based on their interactions working together with the surgery residents when delivering care to the patients. They also said that they are very forgiving when they encountered rude or not cooperating surgery residents because those surgery residents "have been awake for 30 hours or more." EM residents are glad that they opted to pursue EM residency rather than IM residency or surgery residency. According to the EM residents, surgery residents are much more affected mentally and physically by their residency training than EM residents.

4.4.3 Consequences of Burnout

Residents also mentioned that burnout could contribute to making mistakes and engaging in medical errors as they might be tired or not motivated. Burnout, the residents said could also affect the quality of care they provide. Residents elaborated that a burnout resident might not go extra lengths for their patients. Burnout residents might also lack the energy to perform all their tasks on that day, and hence their quality of care might not be superior.

4.4.4 Clusters Generated

Residents agreed with the clusters generated. No residents suggested any missing cluster. IM residents viewed the clusters “coping strategies” and “quality of life” as relating to each other. They also viewed the clusters “profession satisfaction” and “work environment” as relating to each other as residents’ location at the bottom of the hierarchy might influence their “profession satisfaction”.

EM residents were surprised that “patient factors” received the lowest rating for importance. This is because patients could play a major role in their burnout. EM

residents mentioned how they constantly witnessed “needless deaths” of young individuals because of gun violence in Baltimore. These young men “are not the 85-year olds” that one assumes to have medical complications and who is near death. The EM residents overwhelmingly agreed that the location of Johns Hopkins Hospital plays a crucial role in the kind of patients they treat, and hence this location indirectly contributes to burnout. They also added that patient factors might not be a big contributor to burnout if they have worked as residents at suburban community hospitals. Despite this, they agreed that patient factors cluster is the least changeable because “they could not do anything about their patients”. IM residents agreed that patient factors also played a crucial role in the residents’ burnout. However, they argued that the ethos of medicine deeply ingrained within them prevents them from viewing patient factors as an important contributor for burnout. As one resident stated, “the ethos of medicine reminded [them] that [they] need to treat patients regardless of whether the patients bounced back, have medical complications or are confrontational” as this is “part of the medicine”. Some IM residents did argue that it is hard not to feel frustrated with patients who refused to follow their treatments.

4.4.5 Interventions to Pursue

Residents indicated that “work environment” tends to be the easiest cluster to change among the five clusters because as residents, they have rotated around in many units and hospitals and hence have first hand experiences working in many types of work environments. This allows them to view work environment as not a fixed component but rather something that changes from one setting to another. The residents also remarked that many negative work environment factors that contribute to their burnout could easily be fixed with efforts. However, residents also recognized that it would be difficult to change the work environment. One resident gave an example of his quality improvement project that took almost two years to be implemented and faced red tape. His quality improvement project had to be eventually stopped because of this red tape and bureaucracy. Residents also argued that bureaucracy in the department limited the changes that should take place in their program. Another resident mentioned how he sometimes was surprised with the kind of meetings conducted at the departmental level. These meetings, he said, were held to discuss “simple issues that don’t deserve any form of meeting”.

EM residents believed that they work and function the best in the first four hours of their long shift. IM residents reported that 20 hours was the maximum hours before they feel burnout. The long hours were also found to be stressful and tiring by all residents. Most importantly, all residents mentioned that they found the long hours to be less about the medical training, and more about a shortage of residents. “If more residents were around to take care of patients,” the long hours might not be needed said one participant. Additionally, the residents noted that they spent their entire shift working with few breaks. This constant needs to be “on the go” forced them “to crash and feel burnout” on days when they were away from the hospitals. They also could not stop thinking about their patients during the break.

On the other hand, IM residents were conflicted whether fewer hours in their residency training would mean that their training would be inferior compared to the training received by the previously trained physicians. IM residents still equate the long hours with hours of experience. However, they lamented that there are many non-medical tasks such as filling out paperwork that need to be shifted to other staffs such as physician assistants, nurses or scribes.

EM residents felt that the top factor “working long stretches of time without a day off” is more suitable for IM residents as they do not have that work hours culture in their residency. IM residents agreed that this as an important and changeable factor as they do sometimes work “12 or 13 days in a row” without a day off. This, they argued, is mostly due to schedule planning by their specialty. Here too, the shortage of residents was brought up as an important reason why they have to work many days in a row without days off. IM residents also felt that eliminating resident shortages would be tough to achieve as it deals with complex funding rules set by external organizations such as Center for Medicaid and Medicare Services and Accreditation Council for Graduate Medical Education (ACGME). IM residents agreed that this factor contribute to burnout and felt strongly this could be changed at least at the departmental level by working at the schedule planning level.

Both EM and IM residents view the second factor that is mentorship as crucial. However, IM residents felt that all the residents might not utilize mentorship, based on their own experience with undergraduate’s mentorship experience. They felt that having a mentorship opportunity, as an option for the residents, is a

reasonable intervention to pursue. They also added that mentors could be in forms of faculty, attendings, and other senior residents. Both EM and IM residents agreed that mentors served as role models for them. These mentors might help them to go through the residency program with supports and empathy. Additionally, EM residents noted that a mentor is crucial because residents “need someone to talk to about their experience”.

All of the residents agreed that the third factor, relationships with supervising residents, is crucial. IM residents stated that this factor is a “protective factor” that shields them from burnout because their daily interactions with these supervising residents have been positive. IM residents mentioned that supervising residents who are their seniors tend to be more widely present in their training than attendings.

Finally, IM residents felt that there is a sufficient platform for them to vocalize their concerns and hence this fourth factor is already present. EM residents felt that even though opportunities to voice concern is already available, what happens after a concern is expressed is much more important. Without

appropriate responses to concerns that are expressed, both IM and EM residents argued that having the opportunity to express them is futile.

Chapter 5: Discussion

5.1 Burnout among resident physicians

When asked to generate factors that influence burnout among resident physicians, the residents viewed their residency program as the central locus that influences their burnout and hence the factors generated tend to be anchored within this setting. This echoes previous studies that considered burnout as a job-related issue (Maslach & Jackson , 1981; Bakker et al. 2000; Maslach et al., 2001). Residents also indicated that they were aware about the term "burnout" as it is widely used by their colleagues. Hence, the term "burnout" is not a new jargon introduced to these residents by this dissertation but instead a familiar vocabulary used by the residents.

Even though no data on personal experience of burnout were collected in this study, 91% of residents in this study did indicate that burnout is an important issue in their respective specialty. These data served as mere proxy in trying to understand the level of importance of burnout in the residents' own specialty. This high percentage might be due to the fact that only residents who think burnout was an important issue participated in this study. Hence, selection bias

might play a role in explaining this high agreement. Additionally, saying “burnout” is an important topic in their specialties could also mean they have seen others expressing it or experiencing it and hence it might not suggest that 91% of residents are experiencing burnout. Shanafelt et al. (2002) only recorded 76% burnout among IM residents while Takayesu et al. (2014) registered 65% of EM residents facing burnout in their studies.

Furthermore, residents mentioned that burnout is not just an issue limited to resident physicians. Nurses at the Johns Hopkins Hospital are also burnout. Nurses who are burnout do affect the residents because of the close interactions between both professions. This indicates that residents’ experience with burnout is not produced in isolation, but instead influenced by others around them whether they are residents, physicians, nurses, or staff. No burnout literature, to the best of my knowledge, has explored how individuals who are burnout influence another individual’s burnout. No studies have explored whether burnout is diffused within a work setting.

Finally, burnout is a predicted outcome of this rite of passage by the residents based on the results obtained in Phase 3. Residents believed that temporal or short-term and low-level of burnout is part of their rite of passage. Additionally, residents also argued that burnout faced by the residents could be viewed on a spectrum. Some burnout experiences are more severe than others. Therefore, future studies studying burnout should try to divide burnout experienced by the population of interest into categories such as high burnout, moderate burnout, low burnout and no burnout populations to better understand the relationships between burnout and other outcomes such as medical errors. This is especially important as high burnout has been shown to produce negative feelings toward patients while low burnout has been shown to produce positive feelings towards patients in a small study involving psychiatrics (Holmqvist & Jeanneau, 2006). This indicates the levels of burnout might produce different outcomes.

5. 2 Factors that influence burnout

The factors influencing burnout generated by both the IM and EM residents were similar. There are two arguments that could be cited to explain these similarities: 1) the medical care related tasks they perform are quite similar, and 2) the work

setting both residents work in is also similar. Chou et al. (2014) in their study of burnout in a teaching hospital in Taiwan found that the roles performed by the medical professions influence their burnout prevalence. Both IM and EM residents in this dissertation are front care line providers.

Furthermore, these similarities might also be due to the fact that both specialties shared the same location in the hospital hierarchy, and are training in the same hospital. Lim & Pinto (2009) in their study of radiologists in both private hospitals and public hospitals in New Zealand has shown that radiologists working in public hospitals recorded higher rates of burnout compared to radiologists who worked in private hospitals. This shows that setting could influence burnout. Both IM and EM residents in this study work at the same Johns Hopkins Hospital.

The five clusters generated also speak about the fit between the residents and their environment as theorized by the Job-Person Fit Theory (Maslach et al., 2001). As mentioned earlier, this theory argues that burnout emerges because of lack of fit between the persons (e.g., in this study – residents) and the six environment domains which are: 1) workload, 2) control, 3) reward, 4)

community, 5) fairness and 6) values. Jennings & Slavin (2015) had also recommended this theory to reduce burnout among residents. Hence, the 71 factors generated in this dissertation are mapped into these six domains as shown in Table 13. All 71 factors fit neatly into the domains and no new domain was discovered from this study. This further affirmed that the Job-Person Fit Theory is a good theory to explain the emergence of burnout including the emergence of burnout among resident physicians.

Table 13. Mapping Factors into Job-Person Fit Theory Domains

Job-Person Fit Domain	Factors	Cluster
Workload	Lack of time for friends and family	Coping Strategies
	Lack of time for myself (e.g., to engage in hobbies)	Coping Strategies
	Lack of sleep	Coping Strategies
	Lack of rest	Coping Strategies
	Patients who need detailed explanations	Patient Factors
	Patients bouncing back to the hospital	Patient Factors
	Drug-seeking patients	Patient Factors
	Medically complicated patients	Patient Factors
	Not enough time to provide adequate patient care	Work environment
	Amount of daily obligations and responsibilities	Work environment
	Patient volume	Work environment
	Paperwork and administrative responsibilities	Work environment
	Working long stretches of time without a day off	Quality of Life
	Long hours at the hospital	Quality of Life
	Large knowledge base to master	Profession satisfaction
Control	Dealing with loss of a patient, highly emotional care situations, bad outcomes	Patient Factors
	Non-compliant patients	Patient Factors
	Patients who don't want treatment	Patient Factors
	Feeling of accomplishment after a successful diagnosis or treatment	Profession satisfaction
	Pressure to find employment post-residency	Profession satisfaction
	Medicine's inability to fix deep social issues	Profession satisfaction

	Financial stress	Coping Strategies
	Mental health	Coping Strategies
	Difficulties interacting with other services and departments	Work environment
	Residents' location in the hierarchy	Work environment
	Poor technological and administrative support	Work environment
	Lack of schedule flexibility	Quality of Life
	Shift work schedule	Quality of Life
	Commute to work	Quality of Life
Rewards	Lack of positive feedback from patients	Patient Factors
	Low pay	Quality of Life
	Lack of benefits	Quality of Life
	Feeling like your work is appreciated	Profession satisfaction
Community	Relationships with co-residents	Work environment
	Relationships with supervising residents	Work environment
	Mentorship	Work environment
	Having attending who like teaching	Work environment
	Interaction with faculty/attending	Work environment
	Feeling support from administrators	Work environment
	Attending who berate residents	Work environment
	Strained relationships with nurses	Work environment
	Negative interactions with staff	Work environment
	Facilities (i.e., resident work rooms, lounges)	Work environment
	Limited institutional resources	Work environment
	A culture that accepts rudeness	Work environment
	Opportunities for involvement in QI, research, and teaching	Work environment
	A culture of patient-centered care	Work environment
	A culture of high expectations for achievements	Work environment
	Quality time with partner/significant other	Coping Strategies
	Social support from family and friends	Coping Strategies
	Social isolation	Quality of Life
Fairness	An undemocratic work culture	Work environment
	Opportunities to voice concerns	Work environment
	Attending with unrealistic expectations	Work environment
	Confrontational patients	Patient Factors
Value	Job satisfaction	Profession satisfaction
	Doubts about the decision to be a medical doctor	Profession satisfaction
	Doubts about actually helping patients	Profession satisfaction
	Joy at work	Profession satisfaction
	Feeling like the work makes a difference	Profession satisfaction
	Making mistakes	Profession satisfaction
	Healthy Diet	Coping Strategies

	Work-life balance	Coping Strategies
	Physical health	Coping Strategies
	Having Pets	Coping Strategies
	Being able to exercise	Coping Strategies
	Delaying other life goals due to residency	Coping Strategies
	Meditation/spirituality	Coping Strategies
	Volunteer work	Coping Strategies
	Hospital reputation	Work environment
	Vacation time	Quality of Life

5.2.1 Workload

Various studies have affirmed the association between workload and burnout among healthcare providers (Greenglass et al., 2001; Van Bogaert et al., 2013). Patient volume, patients bouncing back to the hospital, long work hours, large knowledge base to master, amount of daily obligation are examples of workload that residents cited as influencing their burnout. When their workload is seen as overwhelming and beyond their ability to handle – residents are bound to experience burnout.

5.2.2.Control

Residents consider themselves as being at the bottom of the hierarchy and rarely have the control on their hours, schedule, patients and work environment. Portoghese et al. (2014) had shown that job control moderate the effects of workload and burnout among healthcare providers. Additionally, Taris et al. (2005) had shown that low controls in certain occupations such as among general physicians do increase burnout. And, Zubairi & Noordin (2016) had shown that lack of autonomy does contribute to burnout among resident physicians.

5.2.3 Reward

Lack of rewards in the forms of low salary, lack of benefits and lack of positive feedbacks are examples of factors that could be considered in this category. A study conducted among HIV positive caregivers found that positive feedback was extremely important in reducing burnout among the caregivers (Bennett et al., 1996). Another theory that could be used to study the relationships between reward and burnout is the effort-reward imbalance model (Siegrist, 1996). Studies have found if there is an imbalance between the efforts for one's work and

rewards one received from the work, there is increased of positive association with burnout domains (Bakker et al., 2000b; Schulz et al., 2009).

5.2.4 Community

Factors such as “strained relationships with nurses” or “relationships with co-residents” are examples of factors said by the residents to influence burnout. Burnout among residents is influence by how they interact within their program and hospital. Hence, having positive relationship is central to reduce burnout among residents.

5.2.5 Fairness

Fairness is another central concept that influences burnout. Residents might view their current work environment as undemocratic and unfair to them. Additionally, residents might view confrontational patients and lack of opportunities to voice their concerns as examples of unfair treatments toward them.

5.2.6 Value

While the ethos of medicine taught the residents to treat the patients respectfully, residents encounter patients that might challenge their values. Additionally, work-life balance might be important for the residents but the long hours and lack of vacations have precluded them from enjoying this important value (Greenhaus et al., 2003).

5.3 Identifying the Interventions

As Maslach et al. (2012) had suggested – burnout interventions should concentrate on multi-level factors. Recognizing this, the factors generated were mapped into socio-ecological model. This helps to identify the various levels involved in influencing burnout. Table 14 shows the location of each individual factor generated within the socio-ecological model (Bronfenbrenner, 1979). The categorization of these factors helped to understand that factors for burnout could be found at all levels of socio-ecological model with intrapersonal level, interpersonal level and organizational level recording the overwhelming factors. The societal factor generated the least amount of influences on burnout in this dissertation. Table 14 shows that burnout is influenced by multi-level factors.

Table 14. Factors for Burnout through the Socio-ecological Model

Level	Factors	Cluster
Intrapersonal	Dealing with loss of a patient, highly emotional care situations, bad outcomes	Patient Factors
	Feeling of accomplishment after a successful diagnosis treatment	Profession satisfaction
	Job satisfaction	Profession satisfaction
	Doubts about the decision to be a medical doctor	Profession satisfaction
	Feeling like your work is appreciated	Profession satisfaction
	Doubts about actually helping patients	Profession satisfaction
	Joy at work	Profession satisfaction
	Pressure to find employment post-residency	Profession satisfaction
	Feeling like the work makes a difference	Profession satisfaction
	Making mistakes	Profession satisfaction
	Healthy Diet	Coping Strategies
	Financial stress	Coping Strategies
	Physical health	Coping Strategies
	Having Pets	Coping Strategies
	Work-life balance	Coping Strategies
	Lack of time for myself (e.g., to engage in hobbies)	Coping Strategies
	Delaying other life goals due to residency	Coping Strategies
	Mental health	Coping Strategies
	Being able to exercise	Coping Strategies
	Lack of sleep	Coping Strategies
	Lack of rest	Coping Strategies
	Meditation/spirituality	Coping Strategies
	Volunteer work	Coping Strategies
Interpersonal	Patients who need detailed explanations	Patient Factors
	Lack of positive feedback from patients	Patient Factors
	Patients bouncing back to the hospital	Patient Factors
	Confrontational patients	Patient Factors
	Drug-seeking patients	Patient Factors
	Medically complicated patients	Patient Factors
	Non-compliant patients	Patient Factors
	Patients who don't want treatment	Patient Factors
	Relationships with co-residents	Work environment
	Relationships with supervising residents	Work environment
	Mentorship	Work environment
	Having attending who like teaching	Work environment
	Interaction with faculty/attending	Work environment
	Feeling support from administrators	Work environment

	Attending who berate residents	Work environment
	Strained relationships with nurses	Work environment
	Negative interactions with staff	Work environment
	Quality time with partner/significant other	Coping Strategies
	Social support from family and friends	Coping Strategies
	Lack of time for friends and family	Coping Strategies
Organization	Not enough time to provide adequate patient care	Work environment
	Amount of daily obligations and responsibilities	Work environment
	Patient volume	Work environment
	Opportunities to voice concerns	Work environment
	An undemocratic work culture	Work environment
	Paperwork and administrative responsibilities	Work environment
	Facilities (i.e., resident work rooms, lounges)	Work environment
	Limited institutional resources	Work environment
	Difficulties interacting with other services and departments	Work environment
	A culture that accepts rudeness	Work environment
	Opportunities for involvement in QI, research, and teaching	Work environment
	Hospital reputation	Work environment
	Residents' location in the hierarchy	Work environment
	Attending with unrealistic expectations	Work environment
	Poor technological and administrative support	Work environment
	A culture of patient-centered care	Work environment
	A culture of high expectations for achievements	Work environment
	Commute to work	Quality of Life
	Working long stretches of time without a day off	Quality of Life
	Vacation time	Quality of Life
	Long hours at the hospital	Quality of Life
	Social isolation	Quality of Life
	Lack of schedule flexibility	Quality of Life
	Shift work schedule	Quality of Life
Societal	Low pay	Quality of Life
	Lack of benefits	Quality of Life
	Large knowledge base to master	Profession satisfaction

5.3.1 Intrapersonal factors for burnout

Intrapersonal factors are factors influenced by residents' knowledge, attitude and belief. Among residents, these intrapersonal factors typically emerged in the

forms of “feelings” or emotions and tasks they could perform. Hence, it is not surprising that most of these intrapersonal factors originate from the "profession satisfaction” and “coping strategies” clusters. Residents consider happiness and job satisfaction as central factors that influence burnout. For residents, external validation in the form of appreciations from others is also viewed as important whereas uncertainty in the forms of doubts and future plans are recognized as important components of burnout. These factors are much more nuanced that the “age”, “gender” and “years of experience” intrapersonal factors.

5.3.2 Interpersonal factors for burnout

Interpersonal factors are factors that relate to relationships and interactions with others. For residents, these other individuals include their co-residents, supervising residents, attendings and administrators within their work setting and family and friends when outside of their work setting. Relationships with their patients were also categorized under this level. Negative interactions such as being scolded by attendings and receiving few positive feedbacks from the patients or positive interactions such as social support from family and friends could all shape burnout among residents. While work interaction might shape the burnout factor, supports from home could also influence burnout.

5.3.3 Organization level factors

Organization level factors have to do mostly with the “work environment” cluster that overlaps with the “quality of life” cluster. While no residents in phase 3 indicate that “work environment” and “quality of life” might relate to each other, many quality of life factors are products of the organization level factors. For example, long hours which falls into the “quality of life” cluster is a direct product of the work policy. One could argue that this work policy is affected by the policies created by lawmakers and hence should be viewed as a societal level factors. However, IM and EM residents at the Johns Hopkins Hospital have different hours of work and hence this policy is much closer to the organizational level factor.

5.3.4 Societal level factors

These factors typically fall under the policy and larger societal issues such as poverty, addiction, lack of health insurance and historical trauma. Two of these factors: 1) large knowledge base to master, and 2) medicine’s inability to fix deep social issues are factors viewed least changeable among the residents. The residents view societal level factors as the hardest level factors to intervene because this level demands extensive amounts of interventions. However, as

Frieden (2010) has argued – this societal level factor might be more impactful than other levels.

Finally, the four top intervention identified are also discussed in the context of future direction in Table 15:

Table 15. Top Four Interventions and Future Directions

Factors	Level	Future Directions
Working long stretches of time without a day off	Organization	The impacts of long hours on the residents have been long studied and debated. McCall (1988) argued that long hours contributed to sleep deprivation among residents, affected their attitudes toward their patients and the quality of care given to their patients. Sleep deprivation among residents who worked long hours (Defoe et al., 2001) and its negatives effects on residents and patients (Mansukhani et al., 2012) were also well recorded. Hence, it was not surprising the recommendation to limit resident hours received supports from both residents and physicians

		(Defoe et al., 2001; Bhananker & Cullen, 2003). However, it is not just long hours that we need to concentrate on but also "working long stretches of time without a day off". As we limit the number of hours a resident should work, we should also pay attention to their day off.
Mentorship	Interpersonal	While residents are now having access to mentors (Castiglioni et al., 2004; Sambunjak et al., 2006; Yehia et al., 2014), residents prefer to "select" their mentor(s) rather than being assigned to these mentors (Yehia et al., 2014). Mentorship has also been shown to influence the personal development and career trajectory of the residents (Sambunjak et al., 2006). Furthermore, lack of mentorship too been associated with increased prevalence for burnout (Mordant et al., 2014). So, more studies need to be done to explore the characteristics of mentorship that

		might help to reduce burnout among resident physicians.
Relationships with supervising residents	Interpersonal	Relationship with co-workers has been shown to be associated with burnout (Zubairi & Noordin, 2016). However, studies have rarely explored the reasons to why relationships influence burnout.
Opportunities to voice concerns	Organization	No study has explored the relationship between the "opportunities to voice concerns" in the context of residency and burnout among resident physicians.

5.4 Strengths of the study

The study explored and generated factors for burnout away from the rigid demographic factors typically found in burnout surveys. Those surveys typically studied the relationships of various demographic factors such as "years in residency", "gender" or "marital status" and burnout. My dissertation tried to generate all the factors that influence burnout among resident physicians by working with the residents. My dissertation also identified many factors that are

missing in the literature. Many of the factors within the "patient factors" cluster are never explored by the previous burnout studies.

My dissertation also had a larger number of participants who sorted the factors into clusters. Rosas & Kane (2012) in their review of 69 CM studies found that an average number of 24.62 participants were involved in the sorting process. This study had 41 residents who completed the sorting and hence outperformed that average by 1.67 times.

5.5 Limitations of this study

The study has a few limitations. I didn't aim to reach saturation when we generated the factors that influence burnout during Phase 1. So, it is possible to have more factors if I continued recruiting more resident physicians. The study was also conducted in an academic hospital in an urban area. Not all residents work in this type of hospital or urban setting so the study's results cannot be generalizable to all of the residents in the US or even to residents in other academic hospital.

Additionally, the method can be laborious and very time consuming to the residents. Resident physicians at the Johns Hopkins Hospital work almost 60 to 80 hours per week. They also work in various different shifts that made it almost impossible to gather them in a group. Once they were out from their work, they were often very tired because they had work almost 12 to 26 hours. They also faced unexpected schedule change and sudden calls that forced them to work extra hours which meant they had to cancel their appointments with me or left quickly after completing only the rating activities. While I tried to use different data collection modes such as factor listing form or online sorting and rating, residents rarely have the time to participate in this study. As a researcher, I had met with residents at 7 a.m. after their shift had ended. Some residents did suggest 11 p.m. (i.e., after their shift ended) as an option to meet. While I tried my best to accommodate the residents' schedule – I was still not able to recruit more than 52 residents. This precludes the factors generated in Phase 1 reaching saturation. So, future researchers working with residents should be more flexible with their time in order to gather data with this population. Group meeting or focus group with residents should also be thought about carefully because of the extremely busy schedule of the residents.

Furthermore, there is little reward to participate in this study. While they do have a chance to win one of four gift cards, not all of them would be motivated by a reward gained by chance. Residency directors did recommend providing reward in the form of small gift cards to attract the residents to participate. In my future studies with the residents, I will provide them with better financial incentive for their time.

5.6 Researcher's bias

All scientific studies are prone to bias. This valuable insight was deeply ingrained during the first year doctoral seminar. Laying down the biases helps to illuminate the interpretation of the finding and the trajectory of the discussion. After all, data are just data. They were given souls and bodies through the cognitive processes of the researcher. Hence, it is crucial to articulate the biases that the researcher might carry.

The study was initiated after discovering that residency is an arduous period for some resident physicians. Through anecdotal evidence (i.e., conversations with other resident physicians) and books written about residency (Shem, 1978), the residency period has been internalized as a very hard phase to be in by the

researcher. This dissertation failed to take into account the lives of residents who truly enjoyed their residency. Like all human experiences, residency period also contains nuances that might be lost to the researcher due to the limited encounter with the narrative of this rite of passage.

Secondly, the researcher assumed that residents would like changes in their residency programs to reduce burnout. This assumption is made because if burnout is seen as a problem, the residents must be eager to have an outsider to come in and articulate their desired interventions. This assumption might drive the constant quest to find the best intervention by the researcher while failing to take into account that some residents: 1) do not view burnout as an important issue or 2) residents might not consider that burnout at Johns Hopkins Hospital needs to be intervened. This bias came to the surface when three residents refused to participate in the study because they did not view burnout as an important issue in residency. This was a great reminder that while I was trying to pursue and create ideal interventions to reduce burnout, not all residents might consider this as an important task to pursue. While it is hard to tell how many other residents shared the same feelings, the study was only able to collect data from 52 residents at Johns Hopkins. While many of them did consider burnout an

important issue, the rest of the residents might not participate in this study because they found no need for it in the first place. Hence, the intervention created from this study might not be fully agreed and needed by all residents.

5.7 Next Steps

A total of 52 residents participated in this study; however, this number only represents about 25% of EM and IM residents at Johns Hopkins Hospital. In order to have a stronger evidence for the intervention, I would have given the surveys to more residents. The participation of more residents will help to generate much more robust data.

Additionally, no data on burnout of residents at the Johns Hopkins Hospital were gathered. This prevents me from recognizing the prevalence of burnout among resident physicians here. While the factors that influence burnout have been generated among IM and EM residents at the Johns Hopkins Hospital, the prevalence of burnout is still unclear. Hence, I would like to conduct a study using the Maslach Burnout Inventory (MBI) to measure the prevalence of burnout among IM and EM residents at the Johns Hopkins Hospital in the future.

I would also like to understand the impacts of burnout on the residents. This includes understanding the impacts of burnout on the residents and patient safety. In Phase 3, some residents did indicate that burnout residents are more likely to provide inadequate patient care so future studies should explore this further. I would conduct an ethnographic study to explore the impacts of burnout on the residents and patient safety. I would gather data through three methods: 1) MBI survey, stress survey, depression survey, 2) survey gathering various data such as medical error, near misses, inadequate patient care etc., 3) interviews with individual residents on how burnout affects them and patient safety, and 4) observation study of how the residents interact with patients.

5.8 Conclusion

This dissertation began to address the current gaps by identifying 71 factors that influence burnout. These 71 factors are aggregated into five different clusters. This dissertation also helped to identify various factors to intervene in order to reduce burnout. It also showed that factors and intervention identified by both IM and EM residents are similar. And, it achieved those by incorporating the voice of the residents throughout the study. While more studies should be conducted to further explore the factors that influence burnout, the Job-Person Fit theory is

a good theory to explain burnout among resident physicians in this dissertation. While four factors to be intervened were identified, more studies need to be done to explore the relationships between these factors to be intervened and burnout.

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Appendix A – Demographic Survey

Study ID:

Demographic Data

1. What is your specialty?
_____ Internal Medicine _____ Emergency Medicine

2. What year of residency are you currently in?
_____Year 1 _____Year 2 _____Year 3 _____ Year 4

3. What is your gender?
_____ Male _____ Female _____ Other

4. Are you married?
_____ Yes _____ No

5. Is burnout an important issue in your specialty at Johns Hopkins?
_____ Yes _____ No

Appendix B – List Factors for burnout

Study ID:

Please list all of the factors, good or bad, that influence burnout among resident physicians. After you are done with this list, you can either email this to mmohdis1@jhmi.edu or call Nasir at 814-3083849 so that he can pick this up from you:

Number	Factors
1)	
2)	

Appendix C – Survey Rating

RATING SHEET

Important and Changeable Factors that contribute to burnout among resident physicians

Please rate on a scale of 1 - 5 how important and changeable each statement is for burnout among resident physicians **Study ID:**

For each statement, circle one response for importance and changeability	Statements
5 Very Important 4 3 Moderately Important 2 1 Least Important 5 Very Changeable 4 3 Moderately Changeable 2 1 Least Changeable	1. Dealing with loss of a patient, highly emotional care situations, bad outcomes
5 Very Important 4 3 Moderately Important 2 1 Least Important 5 Very Changeable 4 3 Moderately Changeable 2 1 Least Changeable	2. Relationships with co-residents
5 Very Important 4 3 Moderately Important 2 1 Least Important 5 Very Changeable 4 3 Moderately Changeable 2 1 Least Changeable	3. Low pay
5 Very Important 4 3 Moderately Important 2 1 Least Important 5 Very Changeable 4 3 Moderately Changeable 2 1 Least Changeable	4. Patients who need detailed explanations
5 Very Important 4 3 Moderately Important 2 1 Least Important 5 Very Changeable 4 3 Moderately Changeable 2 1 Least Changeable	5. Feeling of accomplishment after a successful diagnosis or treatment
5 Very Important 4 3 Moderately Important 2 1 Least Important 5 Very Changeable 4 3 Moderately Changeable 2 1 Least Changeable	6. Commute to work
5 Very Important 4 3 Moderately Important 2 1 Least Important	7. Relationships with supervising residents

5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	8. Healthy Diet
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	9. Financial stress
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	10. Not enough time to provide adequate patient care
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	11. Physical health
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	12. Working long stretches of time without a day off
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	13. Job satisfaction
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	14. Work-life balance
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	15. Doubts about the decision to be a medical doctor

5 Very Important	4	3 Moderately Important	2	1 Least Important	16. Opportunities to voice concerns
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	17. Mentorship
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	18. An undemocratic work culture
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	19. Having attendings who like teaching
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	20. Paperwork and administrative responsibilities
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	21. Facilities (i.e., resident work rooms, lounges)
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	22. Interaction with faculty/attendings
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	23. Feeling like your work is appreciated
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	24. Feeling support from administrators

5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	25. Having Pets
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	26. Attendings who berate residents
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	27. Large knowledge base to master
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	28. Lack of time for myself (e.g., to engage in hobbies)
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	29. Amount of daily obligations and responsibilities
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	30. Limited institutional resources
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	31. Vacation time
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	32. Delaying other life goals due to residency
5 4 3 2 1	33. Lack of positive feedback from patients

Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	34. Difficulties interacting with other services and departments
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	35. Mental health
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	36. Being able to exercise
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	37. Doubts about actually helping patients
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	38. Lack of sleep
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	39. A culture that accepts rudeness
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very Changeable 5 4 Moderately Changeable 3 2 Least Changeable 1	40. Quality time with partner/significant other
5 4 3 2 1 Very Important 5 4 Moderately Important 3 2 Least Important 1 Very	41. Pressure to find employment post-residency

Changeable Changeable Changeable 5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	42. Medicine's inability to fix deep social issues
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	43. Strained relationships with nurses
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	44. Opportunities for involvement in QI, research, and teaching
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	45. Negative interactions with staff
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	46. Patients bouncing back to the hospital
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	47. Confrontational patients
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	48. Lack of benefits
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	49. Long hours at the hospital
5 4 3 2 1 Very Moderately Least Important Important Important	50. Drug-seeking patients

5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	51. Social isolation
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	52. Hospital reputation
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	53. Social support from family and friends
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	54. Joy at work
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	55. Medically complicated patients
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	56. Lack of schedule flexibility
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	57. Lack of time for friends and family
5 4 3 2 1 Very Moderately Least Important Important Important 5 4 3 2 1 Very Moderately Least Changeable Changeable Changeable	58. Lack of rest

5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	59. Non-compliant patients
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	60. Patients who don't want treatment
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	61. Residents' location in the hierarchy
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	62. Attendings with unrealistic expectations
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	63. Feeling like the work makes a difference
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	64. Poor technological and administrative support
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	65. Patient volume
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Changeable Moderately Changeable Least Changeable	66. Making mistakes
5 4 3 2 1 Very Important Moderately Important Least Important 5 4 3 2 1 Very Moderately Least	67. Meditation/spirituality

Changeable		Changeable		Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	68. Volunteer work
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	69. Shift work schedule
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	70. A culture of patient-centered care
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	
5 Very Important	4	3 Moderately Important	2	1 Least Important	71. A culture of high expectations for achievements
5 Very Changeable	4	3 Moderately Changeable	2	1 Least Changeable	

Appendix D – Study Participants

Study ID	Demographic	Phase 1	Phase 2			Phase 3
			Sorting	Importance	Changeability	
IM1	X	X	X	X	X	0
IM2	X	X	X	X	X	X
IM3	X	X	X	X	X	0
IM4	X	X	X	X	X	X
IM5	X	X	X	X	X	0
IM6	X	X	X	X	X	0
IM7	X	X	X	X	X	X
IM8	X	X	X	X	X	0
IM9	X	X	IC	X	X	0
IM10	0	0	0	0	0	0
IM11	X	X	X	X	X	0
IM12	X	X	X	X	X	0
IM13	X	X	X	X	X	X
IM14	X	X	X	X	X	0
IM15	0	0	0	0	0	0
IM16	X	X	X	X	X	0
IM17	X	X	X	X	X	0
IM18	0	0	X	X	X	0
IM19	X	X	X	X	X	0
IM20	X	0	X	X	X	0
IM21	X	0	X	X	X	0
IM22	X	0	X	X	X	0
IM23	0	0	X	X	X	0
IM24	X	0	X	X	X	0
IM25	0	0	X	X	X	0
IM26	0	0	0	0	0	0
IM27	0	0	X	X	X	0
IM28	X	0	X	X	X	0
IM29	X	0	X	X	X	0
IM30	0	0	0	X	X	0
IM31	0	0	X	X	X	0
IM32	0	0	0	X	X	0
IM33	0	0	X	IC	X	0
EM1	X	X	X	X	X	0
EM2	X	X	X	0	0	X
EM3	X	X	X	X	X	0
EM4	X	X	X	X	X	0
EM5	X	X	X	X	X	0
EM6	X	X	X	X	X	0
EM7	X	X	0	X	X	0
EM8	X	X	0	0	0	0
EM9	X	X	X	X	X	0

EM10	X	0	0	X	X	X
EM11	X	0	X	X	X	0
EM12	X	0	X	X	X	X
EM13	X	0	X	X	X	0
EM14	X	0	X	X	X	0
EM15	X	0	X	X	X	0
EM16	X	0	0	X	X	0
EM17	X	0	X	X	X	0
EM18	X	0	0	X	X	0
EM19	X	0	0	0	X	0
EM20	X	0	X	X	X	0
EM21	X	0	X	X	X	0
EM22	X	0	0	0	0	X

X= Submitted data

0= Did not submit data

IC = submitted incomplete data

Appendix E – Factor and Cluster Rating

Cluster		Statement	Importance Average Rating	IM Importance Average Rating	EM Importance Average Rating	Changeability Average Rating	IM Changeability Average Rating	EM Changeability Average Rating
1. Patient Factors			3.13	3.07	3.2	1.85	1.77	1.99
	1	Dealing with loss of a patient, highly emotional care situations, bad outcomes	3.81	3.76	3.89	2.02	2.03	2
	4	Patients who need detailed explanations	2.65	2.66	2.63	1.96	1.8	2.22
	33	Lack of positive feedback from patients	3.63	3.55	3.74	1.94	1.8	2.17
	46	Patients bouncing back to the hospital	3	2.93	3.11	2.3	2.28	2.33
	47	Confrontational patients	3.43	3.43	3.42	1.85	1.73	2.06
	50	Drug-seeking patients	3.15	3.17	3.11	1.79	1.73	1.89
	55	Medically complicated patients	2.9	2.76	3.11	1.56	1.53	1.61
	59	Non-compliant patients	2.85	2.79	2.95	1.65	1.47	1.94
	60	Patients who don't want treatment	2.73	2.62	2.89	1.6	1.53	1.72
Count			Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)
	9		3.43 (0.35)	3.43(0.40)	3.42(0.38)	1.85(0.22)	1.73(0.24)	2.06(0.22)
2. Profession			3.95	3.95	3.94	2.6	2.54	2.71

satisfaction								
	5	Feeling of accomplishment after a successful diagnosis or treatment	4.35	4.17	4.63	2.49	2.38	2.67
	10	Not enough time to provide adequate patient care	4.35	4.48	4.16	3.09	3.14	3
	13	Job satisfaction	4.56	4.59	4.53	3.27	3.27	3.28
	15	Doubts about the decision to be a medical doctor	3.23	3.21	3.26	2.08	2.03	2.17
	23	Feeling like your work is appreciated	4.63	4.62	4.63	3.1	3.2	2.94
	27	Large knowledge base to master	3.75	3.66	3.89	2.04	1.9	2.28
	29	Amount of daily obligations and responsibilities	4.15	4.24	4	2.73	2.47	3.17
	37	Doubts about actually helping patients	3.46	3.48	3.42	2.42	2.4	2.44
	41	Pressure to find employment post-residency	2.56	2.48	2.68	2.55	2.24	3.06
	42	Medicine's inability to fix deep social issues	3.6	3.79	3.32	1.98	2	1.94
	54	Joy at work	4.54	4.66	4.37	3	2.97	3.06
	63	Feeling like the work makes a difference	4.15	4.03	4.32	2.58	2.5	2.72
	65	Patient volume	3.9	3.93	3.84	2.52	2.7	2.22
	66	Making mistakes	4.02	3.97	4.11	2.6	2.4	2.94
Count			Median (SD)	Median	Median (SD)	Median (SD)	Median (SD)	Median (SD)
								176

				(SD)				
14		3.80 (0.56)	3.86(0.59)	3.71(0.56)	2.57(0.39)	2.43(0.43)	2.81(0.41)	
3. Work environment		3.66	3.64	3.69	3.16	3.22	3.06	
2	Relationships with co-residents	4.38	4.34	4.42	3.44	3.47	3.39	
7	Relationships with supervising residents	4.52	4.55	4.47	3.63	3.73	3.44	
16	Opportunities to voice concerns	3.98	3.93	4.05	3.85	3.97	3.67	
17	Mentorship	4.23	4.34	4.05	3.92	4.03	3.72	
18	An undemocratic work culture	3.52	3.52	3.53	3.06	3.23	2.78	
19	Having attendings who like teaching	4.17	4.1	4.26	3.58	3.83	3.17	
20	Paperwork and administrative responsibilities	4.04	4.24	3.74	2.94	3.07	2.72	
21	Facilities (i.e., resident work rooms, lounges)	3.1	2.97	3.32	3.5	3.47	3.56	
22	Interaction with faculty/attendings	4.27	4.17	4.42	3.42	3.5	3.28	
24	Feeling support from administrators	3.9	3.86	3.95	3.42	3.67	3	
26	Attendings who berate residents	4.31	4.28	4.37	3.52	3.6	3.39	
30	Limited institutional resources	3.08	3.14	3	2.52	2.57	2.44	
34	Difficulties interacting with other services and	3.75	3.48	4.16	2.79	2.67	3	

		departments					
	39	A culture that accepts rudeness	3.67	3.55	3.84	3.21	3.13	3.33
	43	Strained relationships with nurses	3.72	3.79	3.63	3.79	4.07	3.33
	44	Opportunities for involvement in QI, research, and teaching	2.94	3.11	2.68	3.49	3.66	3.22
	45	Negative interactions with staff	3.79	3.64	4	3.21	3.28	3.11
	52	Hospital reputation	2.42	2.38	2.47	1.83	1.83	1.83
	61	Residents' location in the hierarchy	2.71	2.69	2.74	1.85	1.77	2
	62	Attendings with unrealistic expectations	3.27	3.31	3.21	2.29	2.23	2.39
	64	Poor technological and administrative support	3.27	3.34	3.16	3.13	3.13	3.11
	70	A culture of patient-centered care	3.46	3.41	3.53	3.21	3.23	3.17
	71	A culture of high expectations for achievements	3.67	3.55	3.84	3.1	3.03	3.22
Count			Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)
	23		3.08(0.55)	3.14(0.55)	3.00(0.58)	2.52(0.56)	2.57(0.63)	2.44(0.48)
4. Quality of Work Life			3.56	3.47	3.71	2.91	2.92	2.91
	3	Low pay	3.17	2.93	3.53	2.9	2.97	2.78
	6	Commute to work	2.63	2.59	2.68	3.23	3.13	3.39
	12	Working long stretches of time without a day off	4.69	4.69	4.68	3.58	3.53	3.67

	31	Vacation time	3.92	3.72	4.21	2.92	2.8	3.11
	48	Lack of benefits	2.73	2.62	2.89	2.85	2.97	2.67
	49	Long hours at the hospital	4.25	4.24	4.26	2.52	2.5	2.56
	51	Social isolation	3.66	3.86	3.37	2.79	2.79	2.78
	56	Lack of schedule flexibility	3.88	3.72	4.11	2.81	2.73	2.94
	69	Shift work schedule	3.15	2.83	3.63	2.63	2.83	2.28
Count			Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)
9			2.73 (0.66)	2.62(0.71)	2.89(0.63)	2.85(0.30)	2.97(0.27)	2.67(0.40)
5. Coping Strategies			3.89	3.91	3.86	2.98	2.88	3.14
	8	Healthy Diet	3.63	3.69	3.53	3.81	3.77	3.89
	9	Financial stress	3.63	3.52	3.79	2.6	2.5	2.78
	11	Physical health	4.27	4.34	4.16	3.48	3.4	3.61
	14	Work-life balance	4.75	4.83	4.63	3.17	3.03	3.39
	25	Having Pets	2.08	2.03	2.16	3.23	3.1	3.44
	28	Lack of time for myself (e.g., to engage in hobbies)	4.1	4.17	4	2.73	2.63	2.89
	32	Delaying other life goals due to residency	3.9	4.07	3.63	2.13	1.8	2.67
	35	Mental health	4.31	4.34	4.26	2.94	2.87	3.06
	36	Being able to exercise	4.13	4.24	3.95	3.19	3.03	3.44
	38	Lack of sleep	4.42	4.41	4.42	3.04	2.97	3.17
	40	Quality time with partner/significant other	4.5	4.48	4.53	2.88	2.87	2.89
	53	Social support from family and friends	4.38	4.48	4.21	2.75	2.67	2.89
	57	Lack of time for friends and family	4.33	4.28	4.42	2.88	2.93	2.78
	58	Lack of rest	4.44	4.52	4.32	2.9	2.9	2.89

	67	Meditation/spirituality	2.92	2.9	2.95	2.9	2.7	3.22
	68	Volunteer work	2.44	2.24	2.74	3	2.9	3.17
Count			Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)	Median (SD)
	16		4.22(0.75)	4.29(0.80)	4.11(0.68)	3.06(0.36)	2.95(0.40)	3.25(0.33)

Appendix F - Comparison of Cluster Ratings Between Male and Female Residents

Clusters	Variables	Male			Female					
		M	SD	n	M	SD	n	t	df	p
1. Patient Factors	Importance	3.0684	0.1659	9	3.1704	0.2757	9	-0.4605	16	>0.05
	Changeability	1.9644	0.0713	9	1.7185	0.0669	9	1.9843	16	>0.05
2. Profession Satisfaction	Importance	3.9560	0.3611	14	3.9714	0.3497	14	-0.0683	26	>0.05
	Changeability	2.7328	0.1557	14	2.5190	0.2630	14	1.2363	26	>0.05
3. Work environment	Importance	3.7057	0.2904	23	3.5391	0.4425	23	0.9333	44	>0.05
	Changeability	3.1774	0.2959	23	3.2406	0.4648	23	-0.3475	44	>0.05
4. Quality of Work Life	Importance	3.5299	0.4293	9	3.6148	0.4738	9	-0.2680	16	>0.05
	Changeability	2.8356	0.1154	9	3.0963	0.1196	9	-1.6134	16	>0.05
5. Coping Strategies	Importance	3.8870	0.5018	16	3.9333	0.6078	16	-0.1758	30	>0.05

Mohd Nasir Mohd Ismail

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EDUCATION:

Ph.D.(c), Social and Behavioral Sciences, August 2016
Johns Hopkins University, Bloomberg School of Public Health
Armstrong Institute For Patient Safety Leadership Fellow
Dissertation: Exploring the risk and protective factors that influence burnout among resident physicians and developing native solutions.
Advisor: *Dr. Andrea Gielen, Director of Center for Injury Research and Policy*
Committee Members: *Dr. Albert Wu, Dr. Janice Bowie, Dr. Sallie Weaver and Dr. Sarah Lindstrom-Johnson*

MS, Energy and Mineral Engineering
Pennsylvania State University, *May 2010*

BS, Physics with minor in Middle East Studies
Pennsylvania State University, *May 2007*

STRENGTHS:

- Using mixed-method study to both understand and illuminate the granular nature of various social science problems
- Examining social science problems and finding solutions through multiple cultural perspectives
- Thinking critically about various social science problems by trying to uncover how variables are created before being examined statistically
- Employing and adapting various social science theories to social science problems
- Creating various cues to better improve quantitative and qualitative data collection
- Teaching and helping others to understand various social science subject matters

WORK AND RESEARCH EXPERIENCES:

Doctoral Dissertation June 2014- August 2016
Johns Hopkins University

- Conduct a primary mixed-method study to explore factors for burnout and identify interventions to reduce burnout among resident physicians
- Manage the whole project from proposal writing, IRB application, recruitment, data storage, data analysis, data presentation to manuscript writing

Research Assistant Summer 2016

Johns Hopkins University

- Collaborate on a grant application to create a platform to train community to participate in community engagement projects
- Collaborate in preparing a manuscript that identifies principles of patient-centered outcomes in a Patient-Centered Outcomes Research Institute (PCORI) funded research study

Senior Research Coordinator February 2013 – March 2016

Johns Hopkins University | Armstrong Institute for Patient Safety and Quality

- Collaborate on patient safety component of national collaboratives to reduce surgical site infections and to reduce ventilator-associated pneumonia
- Manage collecting and analyzing safety culture data for an Abu Dhabi project to reduce central line-associated bloodstream infections
- The data collection process aims to improve the hospital and individual participation rates by presenting the scientific rationales for the surveys. Additionally, the participations rates are monitored by generating reminders to the coordinating entities and recommending cues to the project leaders. These tasks help me better understand the facilitators and barriers of quantitative and qualitative data collections.
- Involve in the data management of these data. The massive amount of data will be used to better understand how safety culture could be used to reduce surgical, ventilator and central-line infections
- Conduct data analysis to better understand the non-punitive culture in Abu Dhabi where a large populations of the workforce originated from almost 80 countries
- Test the validity and reliability of the US-based survey being used in Abu Dhabi

Research Assistant Summer 2013- January 2014

Johns Hopkins University | Center for Injury Research and Policy

- Collaborate on communication-based pedestrian safety campaign to reduce pedestrian injuries on campus
- Collect needs assessment data to understand the contributing factors impacting pedestrian safety with both focus groups and surveys
- Perform factor analyses and reliability tests, as well as support survey development

Research Assistant Summer 2011 – Summer 2012

Johns Hopkins University | Center for Injury Research and Policy

- Conduct systematic literature review on child injury in China
- Analyze recent health research for pedestrian campaigns in China
- Assess the pedestrian and cyclist safety around JHU campuses after death of 2 students
- Collect needs assessment data through focus groups and observation studies
- Propose solutions to university administrators

Master's Thesis Fall 08 - Spring 10

Pennsylvania State University | Department of Energy and Mineral Engineering

- Conduct research on fatalities in US mines
- Found that aging workers with >15 years of experience and young workers with <1 year of experience had elevated risk for fatality
- Thesis presented at Pennsylvania Governor's Occupational Health and Safety Conference (2009) and American Society of Safety Engineers Conference (2010)

Research Assistant for Master's thesis research Summer 08

Pennsylvania State University | Department of Energy and Mineral Engineering

- Support research regarding use of flame arrestors in a natural gas plant in Korea
- Model the spread of toxic gases using ALOHA and CANARY
- Results showed that flame arrestors were not needed in the gas plant

Research Assistant to Master's thesis research Summer 06 – Summer 07

Pennsylvania State University | Department of Agronomy

- Support research for thesis in the Department of Agronomy
- Compare the fatty acids in ground beef from cattle fed on pasture or stored feed
- Results showed that pasture feed beefs had twice the amount of fatty-acids Omega-3 than stored feed

LEADERSHIP:

General Secretary

Johns Hopkins University | Graduate Muslim Students Association 2013 – 2014

- Lead a group consisting of American and international students
- Raise funds ranging from $4000 to $10,000 to serve food for breaking the fast to students ranging from 45 students twice a week (summer of 2011) to 110 students four times a week (summer of 2014)
- Select and serve appropriate dishes for students from many cultures

INTERNSHIP EXPERIENCE:

Safety Intern April 2010 - August 2010

Salimetrics | State College, Pennsylvania

- Improve safety program by reviewing OSHA requirements
- Perform job hazard analysis by reviewing EU REACH requirements
- Update the safety data and studied the chemical hazards used in the labs

TEACHING EXPERIENCES:

Graduate Teaching Assistant Fall 2013 – Summer 2016
Johns Hopkins University

- Support diverse students from multiple disciplines and countries
- Achieved "excellent" or "good" for over 95% of ratings

Graduate Teaching Assistant Fall 07 – Fall 09
Pennsylvania State University

- Teach and grade two undergraduate general science classes
- Awarded the Outstanding Graduate Teaching Assistant award

***Summer Instructor* for Underrepresented High School Minorities** Summers 08 & 09
Pennsylvania State University

- Instructor for summer research programs for underrepresented high school minorities' students from around Pennsylvania
- Share safety science and highlight the science and engineering fields through motivating guest lectures

PUBLICATIONS:

Pollack, K., GielenA., Mohd. Ismail, MN., Wu, M., Mitzner, M. (2014). Pedestrian Injury Study in Urban Campus. Journal of Principle to Injury Epidemiology.

Mohd-Ismail, M.N., Haight, J.M. (2010). Older Workers: Asset or Liability for Your Company? The Case Study of Metal and Non-metal Mines. 2010 American Society of Safety Engineer Professional Development.

PRESENTATIONS:

Mohd-Ismail, M.N., Haight, J.M., "Older Workers: Asset or Liability for your company?" American Society of Safety Engineers 2010 Conference, Baltimore, MD, 16 June 2010.

Mohd-Ismail, M.N., "Analysis of Fatal Incidents in Metal and Non-Metal Mines." Department of Energy and Mineral Engineering, The Pennsylvania State University, University Park, PA, 6 November 2009.

Mohd-Ismail, M.N., Haight, J.M., "Redesigning Workplace for Aging Workers." Pennsylvania Governor's Occupational Health and Safety Conference, Hershey, PA, 19 October 2009.

Mohd-Ismail, M.N. "Risk Index and Fatalities for Older and Younger Workers." Department of

Energy and Mineral Engineering, The Pennsylvania State University, University Park, PA, 4 May 2009.

Mohd-Ismail, M.N. "Cognitive Decline among Aging Workers". The Pennsylvania State University, University Park, PA, 16 March 2008.

ACCOMPLISHMENTS:

- Armstrong Institute for Patient Safety Leadership Fellow
- Environment, Energy, Sustainability and Health Institute 2013 Fellow at the Johns Hopkins University
- Scholarships from the Department of Health, Behavior and Society, The Johns Hopkins University from Summer of 2011 to Summer of 2016
- Outstanding Graduate Teaching Assistant Award – Safety Science Fall 2007
- American Industrial Hygienists Scholar (Lehigh Valley, PA)
- Graduate Assistantship for Master's program from the Department of Energy and Mineral Engineering, The Pennsylvania State University
- Teas Scholar for third year Physics Student at Penn State
- Shibley Scholar for undergraduate Middle East Studies Student
- Malaysian Government Scholar

LANGUAGES:

English GRE Verbal: 96th Percentile
Malay National language